

# Riemann, Metatheory, and Proof

Riemann's Hypothesis, metamathematics, solutions, and proofs

A pre-print manuscript in progress, by Michael Lucas Monterey.

Use is permitted for review and comment only.

2016 to 2022, revision completed March 30, 2022

**Abstract:** Historical analysis, new discoveries, and explanation enable understanding of Riemann's Hypothesis (**RH**), his zeta function, and the principles enabling them. The multiple proofs presented also enable upgrading metamathematics, set theory, number theory, proof theory, and several other domains of discourse. The terms and definitions support comprehensive proof and enable deeper understanding of the full scope of the historic context and causes of the problem (**RH**). The "Results" (Section 2) provides proofs, the context of work on **RH**, and proofs of closely related problems, including a perfect disproof of the **P/NP** problem. Proof of how primal numbers may be precisely, rapidly, and economically located also supports this proof of **RH** (etc.). The following sections include commentary, notes, and references.

## CONTENTS & SECTIONS

---

0. Abstract & Contents	1
1. Introduction	2
1.1 Prologue	3
1.2 Definitions	7
1.3 The Domain	78
1.4 Acknowledgements	79
2. Results	80
2.1 Proof & Metatheory	80
2.2 Metamathematics	87
2.3 Metamorphology	103
2.4 Structural logic	110
2.5 Functional logic	117
2.6 Semiotic logic	119
2.7 Primal logic	123
2.8 Related proofs	125
3. Discussion	140
3.1 Commentary	140
3.2 History	143
4. Notes & Sources	150

# 1. Introduction

“Don't get involved in partial problems, but always take flight to where there is a free view over the whole single great problem, even if this view is still not a clear one.” – Ludwig Wittgenstein

Before I discovered that quote, Wittgenstein's approach already seemed the best possible way to understand and prove anything true, or untrue, or undecidable.

Now, on the importance of simplicity and the wholeness of things, I agree with Newton and Wittgenstein. Also, though few 6-year-olds may read this, I agree with Einstein. He thought that basics of great theory should be explicable to interested children (if not, “you don't know what you're talking about”). Still, it helps to remember that, like Newton and other humans, Riemann and Einstein (even Kurt Gödel) suffered some limiting beliefs and erroneous assumptions.

So, as my research on Bernhard Riemann's million dollar problem (his famous hypothesis, **RH**) progressed, it became obvious that an ideal proof required sufficient history and analysis of the whole context of the problem, and how to solve and explain it (with great explanatory power and no valid disprovability). It also became obvious that pure mathematics (maths) exists to discover, think about, and communicate realities. So, this paper is intended for all lovers of numbers, geometry, maths, logic, and reality, especially teachers of maths and specialists (in maths and logic).

There are many good reasons for that. Briefly, **RH** is **a)** uniquely important, **b)** rare, **c)** why it was unsolved for 158 years, and **d)** why it matters. First, **RH** is considered so important that the Clay Institute of Mathematics made it one of seven “Millennial Challenge” problems, with \$1 million (USD) prizes for each solution. Also, as explained below, all serious mathematicians and logicians consider **RH** the most important problem in modern maths.

**RH** is rare because so many brilliant mathematicians failed to understand how to solve it for so long. Also—unlike many problems involving elemental principles and functions—**RH** is based on a self-verifying operation: Riemann's zeta function (and formula, both symbolized here by  $\zeta$ ). In fact, few other problems of maths are as baffling to the vast majority of mathematicians and logicians. So, despite the prize and all the great minds, without enough understanding, no prior proof provided comprehensively satisfactory explanation.

Other supports for the importance and rarity of **RH** and  $\zeta$  are **a)** hundreds of incredibly potent uses in maths and science, even without absolute proof, **b)** **RH** and  $\zeta$  relate directly to the core principles of logic, maths, numbers, number theory and metamathematics (metamaths), the logical and metalogical foundation of maths, **c)** because, as intuited by some, proof requires and provides new keys and tools enabling a new era of maths, science, philosophy, and thus of society, and **d)** proving **RH** confirms the fracturing and stagnation of metamaths and Western philosophy while enabling healing.

Almost prophetically, David Hilbert, who inspired the Clay Institute challenge, saw **RH** as the most important of all maths problems, one that might open up new frontiers and unimaginable possibilities for real progress in maths, etc. I agree. So, initially, I neither started nor continued

this project to 'win' prize money, nor to complete the foundation of maths and logic. However, that soon came to seem an unavoidable necessity. Fortunately—being a veteran [independent] interdisciplinary researcher and generalist—learning to think outside the standard toolbox had become habitual.

My experience and aspirations also taught me how I might put prize money to great use (for the sake of future maths, ecotecture, and cultural evolution). So, thanks to the Clay Institute, the possibility was encouraging. The fact that 6 Millennium Challenge prizes remained unclaimed was increasingly intriguing and provocative.

Also, numbers, symbols, language, codes, spies, science, and science fiction always fascinated me. So, aiming for superior logic design, stronger cryptography, and better data compression, I hoped to solve problems in cyber-space and computer science. Inevitably, learning how to create superior IT ecotecture and coding logic required ever deeper study of number theory and the metatheory of maths. Starting a 21-year study of the hardest problems in the history of maths was unintentional.

Then, I stumbled upon **RH**. It soon led to wondering why and how so many brilliant and intuitive mathematicians failed. It seemed so amazingly unlikely. Just studying and using  $\Re_{\zeta}$  had enabled great breakthroughs in science and maths, but not a generally satisfying, definitive, absolute proof that **RH** is true.

This paper provides that proof, and explains how, and why **RH** and other important problems were unresolved for so long. It succeeds partly by correcting defects of metamaths and Western philosophy. Those root level problems are reviewed and explained in most of the following sections, yet the following prologue offers an introductory summary.

## 1.1 Prologue

You may already know something about the problem but, probably, you failed to realize that Riemann asked the wrong question. Evidently, that—and failing to realize that—became a habit of most if not all other investigators. This paper answers the right questions. So, as implied above, the purpose of this paper is proof (of **RH**), solving the real problem, proving the validity of the root cause and solution, with comprehensively definitive explanation.

Now, in a paper on approximating the seemingly random distribution of primal numbers, AKA “primes” (see defs., Primality & Primal numbers, Section 1.2, below), Riemann mentioned wondering if—when using  $1/2$  with  $\Re_{\zeta}$  —“all the roots” of the resulting zeroes (in his graph) were real (numbers). Yet, ever since, everyone else agrees that what he really wondered was whether or not the zeroes on the vertical line at  $1/2$  (in the graph of  $\Re_{\zeta}$ ) could go on forever, always, only on that line. In the paper, Riemann said he would like a proof, then that he worked at it for awhile, but gave up.

Obviously, what he did not wonder or ask or investigate is why  $\Re_{\zeta}$  makes any zeroes appear in the positive side of the graph on the line at  $1/2$ . Nor did Riemann and other investigators ask

why  $\Re_{\zeta}$  using  $1/2$  puts zeroes on the negative side of graph only at  $-2n$ , *i.e.*,  $-2, -4, -6, \dots \rightarrow -\infty$  (to negative infinity). Riemann may have thought such issues moot or trivial and, living before the invention of modern metamaths, he had an excuse

Now, after the failures of the great pioneers of modern maths and metamaths, there is really no good excuse. Yet, they and their followers and competitors kept on failing to wonder about and investigate the actual nature of **RH** and  $\Re_{\zeta}$  and the causal, enabling principles required for their existence. So, perhaps out of awe for their famous predecessors, they also considered the zeroes at  $-2n$  “trivial” (without asking why). Apparently, they also failed to ask why the line at  $+1/2$  is called “the line of symmetry.”

In fact, in hundreds of other papers and the many books about **RH**, we can find no mention of serious investigation of the critical terms, issues, enabling principles, and clues. Yet, that was what enabled perfect proof and definitively comprehensive explanation. As indicated, that required thorough deconstruction, analysis, and explanation of the context and the cause of the problem, and of the chronic failure to find an acceptable solution with conventional thinking and methods (used by other investigators).

This approach was necessary also because, evidently, the sociological paradigm of maths tends to limit what mathematicians and their “community” can think of, discuss, and accept as acceptable new concepts, discoveries, theorems, and proofs.

In fact, during final development of this paper, emailing and posting preprint drafts for open review and comment (or critiques by mathematicians), it became increasingly obvious that the problems mentioned above are real. So far, the only critique showed that the author skipped over the unfamiliar logical elements (of proof) and misunderstood the rest (taking them out of context).

That supported another prime motive, the shock of finding that most mathematicians, maths teachers, and their students know nothing of **RH** and metamaths (the logical foundation of maths), and little or nothing about numeric logic and number theory (the basics). Clearly, most of us have no idea why they should seem important. The long-form explanation of that (and the **RH** problem) requires the rest of this paper.

John Derbyshire provided a good short-form explanation in his book, *Prime Obsession: Bernhard Riemann and the greatest unsolved problem in mathematics*. Derbyshire said that the quest to find proof or disproof of **RH** is in a “stalemate” mode. That over-simplification relates to the heart of the problem. Yet, the problem with **RH** is as complex and complicated as the histories of maths, science, philosophy, religion, language, commerce, and civilization.

Now, you may want to ask why, and, “Is resolving **RH** really worth \$1 million (USD)?”

Good questions. So, remember, in 1859, using the zeta function with his new formula ( $\Re_{\zeta}$ ) and complex numbers, Riemann discovered an amazing result. He then guessed that graphing  $\Re_{\zeta}$  for  $1/2$  might always produce a sequence of zeroes on “the line of symmetry” (halfway between

0 and 1 on the “real” number line) on its way to infinity. That over-simplifies the issue, but the rest of this paper covers all the related issues, including why a solution seems worth a million dollars.

Rememberin this will help:  $\Re_z$  reveals a close approximation of the zeroes (of  $\text{Re}+ @ 1/2$ ) to the distribution of ‘prime numbers’ (primals) in the serial sequence  $S_N$  (of “natural” positive whole numbers). For mathematicians, logicians, and a few physicists, among others,  $\Re_z$  always doing that, reliably, would be good to know. It would confirm certainty and justify trust in hundreds of theorems that rely on **RH** being true. In fact, despite its previously questionable reliability, using  $\Re_z$  enabled useful work reported in more than 500 papers, some by physicists.

So, while baffling highly respected mathematicians of real genius, **RH** and  $\Re_z$  provoke awe and wonder. For many brilliant mathematicians, apparently, that made **RH** an unusually tempting challenge. It may have seemed almost like the challenge of defeating the greatest swordsman of the ancient world, or killing the fastest gunslinger in the Old West.

However, competition was not the only focus of interest and progress. Riemann’s development of non-Euclidian geometries (with  $\Re_z$ ) also led to the development of other exotic expansions of maths and logic now used in almost every branch of applied science and technology. For example, both **RH** and  $\Re_z$  were important in the development of research in information theory, computability, and related fields. Therefore, so far, ever more supercomputer verifications show that  $\Re_z$  might keep putting more zeroes on the line of symmetry forever, without proving **RH**.

Oddly, most contenders still fail to understand why they keep failing. It seems almost as if most super-star pioneers are always more interested in playing with their vast box of toys, tools, and techniques. Maybe, like most electronics innovators, brilliant mathematicians are uninterested in what makes their devices work (the intrinsic logical and metalogical principles that enable and empower them). Maybe, the problem is using the same kind of thinking and the same kinds of approaches over and over, again and again, while expecting different results.

Of course, that was Einstein’s definition of insanity (or stupidity?). Still, since 1859, **RH** and the missing proof inspired some of the most important, creative, sophisticated, complicated, and frustrating work in the history of maths. Yet, none of it focused mainly on basic numeric logic and the elemental principles enabling maths, nor on the nature of numbers and what enables their existence, forms, structures, functions, semiotics, and potentials.

Why not? Partially because the composite numbers, their multiples, their enabling principles, regularities, and symmetries were of little or no interest to most mathematicians, from long before Riemann’s time. However, recall that primal numbers (the “primes”) and their enabling principles, properties, and irregularities can exist only in reciprocal relativity to nonprimal composites ( $C_n$ ). Those nonprimals follow and precede the primal numbers in the sequence of all positive whole number sums of  $n + 1 \dots \rightarrow +\infty$  that could go on forever if we could. However, instead of seeing all numbers as logical relatives in a numeric forest, previous investigators saw only primal trees, as if they were isolated, accidental flukes of illogic.

That left only this logical approach. It reveals and explores new territory, enabling a new way of seeing maths, physics, and reality. That enabled new theory, new metatheory, new metamaths, new semiotics, and the multiple unconditional proofs presented in following sections.

Obviously, missing a viable conceptual foundation of theory and metatheory (of metamaths) required and maintained linguistic and cultural deficiencies and defects. They still impact the foundations of maths, science, philosophy, psychology, government, civilization, and Earth's living biosphere. Understanding why requires understanding the limits of what was thinkable by the previous investigators, including Riemann.

Fortunately, deconstructing civilization's deficient post-Einsteinian paradigm enables paradigm repair and evolutionary progress. When do that, we will then see what most investigators missed in Riemann's original statement of the hypothesis, the clue for how to find and develop an elegantly logical solution. That clue, Riemann's reason for giving up on finding proof, enabled the solution. It enables a new understanding of numbers, logic, maths, and their relationship with the basis of reality, being, and its nature.

Yes, as predicted and proven,  $\mathfrak{R}_z$  relates to hundreds of important relationships and processes that make this world what it is and how it is. So, it seemed that **RH** and  $\mathfrak{R}_z$  contained hidden keys to the gateway of a new era of discovery. In this case, the missing keys were hidden in plain sight.

Yet, proving **RH** and initiating a new realm of metamaths is as difficult as proving a new paradigm theory of physics was for Einstein and his QM successors. Proving and explaining **RH** and new number theory with new metatheory of maths and logic could only succeed with an equally complex body of proofs, supporting information, and examples.

So, for amateur math enthusiasts and mathematical specialists still unfamiliar with **RH** and the core level problems in metamaths, this paper includes commentary on existing and new theory and results. Hence, the following sections offer the basics essential for understanding and proof. Remember though, as with other languages, communicating and understanding the language of maths depends on knowing the enabling terms and definitions. So, key terms and definitions precede the following sections of the text. For example, the upgraded definition of the principle of permanence (**POP**)—a key element of the solution and proofs—makes the validity of this solution (of **RH**) self-evident.

The "Acknowledgments" are included with gratitude for the great geometers, mathematicians, pioneers, mentors, and supporters who made this work possible, compelling, and necessary.

Section 2 provides proofs of **RH** per all the levels of logic that enable and sustain the functionality of  $\mathfrak{R}_z$  and metamaths, maths, geometry, logic, numbers, sets, etc. New theorems, conjectures, and explanations are included. Also (despite 3,000 years of erroneous opinions), definitive explanations and graphics prove that the exact locations of all primal numbers can be easily found with modern computers. (see figures 1 & 2)

**RH**, Goldbach's conjecture (**GC**), the 'twin prime' conjecture (**TPC**), the Collatz conjecture (**CC**),

the principle of permanence (**POP**), and Newcomb-Benford (curve and) natural distribution rule (**NDR**) as verification of a perfectly logical, unconditional disproof of the **P/NP** problem. They also support the validity of this proof of **RH**, and the enabling theory and metatheory.

Section 3 provides more contextual information. It includes implications and predicts advances possible with applications of the results. The predictions are provided for inspiration and for verifying this proof, the theorems, and new metatheorems.

While not exhaustive, notes, references, sources, and resources enable cross-checking of claims, for assessment, evaluation, and potential extension of the work and the results. Much of the work deconstructs and critiques the historic sociocultural, neurolinguistic causes and context of the problem that prevented a satisfactory solution: perfect proof of **RH**.

## 1.2 Definitions

“A mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock at our efforts. It should be to us a guide-post on the mazy paths to hidden truths, and ultimately a reminder of our pleasure in the successful solution.” – David Hilbert

Hilbert was obviously right about that, and it rings true for any other branch of science. Yet, as in maths, almost all educators and practitioners of modern physics and astronomy seem to be having too much fun on their mazy paths, avoiding the scary heights and depths. So, realities remain hidden by ever more mystifying SM hypotheses, illusions, and anomalies. That keeps the basic theories of the sciences unified. So, most of us now seem unaware of the difference between pure science (and maths) and the more popular, commercialized, technical disciplines.

Unfortunately, general ignorance of the history of science and maths, and of epistemics, semiotics, and the history of language and philosophy aggravate the problem. So, hopefully, this introduction to the definitions of terms helps enable understanding of the new proofs of **RH**, the theory, and metatheory of the holonomic ontology of mathematics (maths). That could help solve the problem, enabling a more realistic SM of science and society.

Science and maths, like team-sports and successful societies, require shared contexts, definitions and effective usage of all the key terms. However, using English (or any other natural human language) to consider principles of a future paradigm requires a new way of thinking about communication and reality. For example, consideration of Einstein’s new way of describing reality required courageous openness, and willingness to question the basis of socially accepted ideas about reality (and religion), plus unusually great mental effort. New metatheory poses a similar challenge, calling for equal or greater openness, courage, and commitment.

First—to unify the theories of science and math—the deficiencies of semantics, ontology, culture, and our institutional ethics, call for a major paradigm upgrade. So, remember that languages embody and express inherent biases, based on their sociocultural paradigms. The languages of mathematicians and physicists prove and maintain that ancient norm.

In fact, the incredible pronouncements and exotic rhetoric of pop-star quantum mechanics (QM) have become the anti-theistic Word of god (and its anti-logical zoo of supernatural particles

with magic powers, colors, extra dimensions, etc.). Nietzsche saw it coming, with increasing horror and dismay. Among others, Hilbert, Gödel, and Einstein were confused, eventually baffled, and gave up on their projects. So, a unitive, realistic SM clearly requires previously absent knowledge, the concepts, words, and shared meanings necessary for effective thought and communication (about the nature of being and reality).

Hence, the following list covers the core logic of **a)** a next-gen SM of science and society, **b)** the context and basics of essential metatheory, and **c)** of the next SM sociocultural paradigm. Redefinition of the key terms and principles of ontology and its enabling domain of discourse is meant to evaporate the fog of normalized confusion and materialistic rhetoric.

Yet, the nature of the subject (being and its nature) transcends the domains of the physical sciences. Therefore, for the sake of unification, some terms and definitions reflect that reality. Clearly, better theory and viable metatheory require better concepts and terms, and upgrades of others. Next generation (next-gen) theorems and proofs require some redefinitions of various terms. Completing the unfished foundation of mathematical logic also requires re-interpretation of some concepts and theorems (for congruency with nature's enabling principles). The reasons (and examples) accompany the definitions and redefinitions.

Naturally—for the most satisfying results—it would be best if unlimited thinking and better communication happen as soon as possible. So, the following terms and definitions are listed in approximate order of significance, with priority given to commonly misunderstood terms (re: science, logic, proof, etc.).

**Absolute proof:** Unlike conventional unconditional proofs and 'finitistic' proofs, absolute proof of a theorem or metatheorem may refer to primordial natural phenomena and primal principles that make it true, and unfalsifiable.

Absolute proofs combine comprehensive logic with definitive explanation and the results of experimental verification. So, a metatheorem may be proved absolutely within the context of a holonomic domain of discourse, as in holotropic ontology or metamaths, or in a holonomic metalinguistic metatheory.

**Perfect proof:** A perfect proof includes definitive, logical, and elementary proof of absolute truth, unconditionally verifying a conjecture, a theorem, or a proof. Perfect proof is also congruent with natural principles, relevant metatheory, and related theorems.

So, perfect proofs can explain exactly why hypotheses, theorems, and proofs are valid or truly viable. For example, a theorem or metatheorem may be finitistic and truly complete, derivable from and proven per enabling principles, axioms, and holonomic meta-axioms, thus, durably reliable. Hence, perfect proof covers and resolves the whole of a problem. So, perfect proofs require and enable optimal explainability, eliminating or minimizing disputability. Yet, though a perfect proof of a conjecture or theorem may be falsifiable, its elements and essentials may be unfalsifiable metatheorems and meta-axioms. Still, falsifying a perfect proof requires foolishness (using logical fallacies, erroneous thinking, etc.).

**Elementary proof:** An ideal elementary proof shows that a phenomena or truth is a) real or unreal or b) does what it does or c) does not or cannot do something. Logically (if not



comprehensively), an elementary proof verifies basic truths or enabling elements of the subject of a hypothesis or theorem, or else it disproves something about the subject.

Euclid's famous proof—that the possible quantity of primal numbers (the 'primes') cannot be finite—is an example of an elementary (yet non-explanatory) proof. So, elementary proof that some things or sets of things are infinite may not be disprovable, yet not enable explanation of how and why they are infinite.

**Unconditional proof:** An unconditional proof may be elementary, absolute, or perfect, or simply technical, yet may be as falsifiable as any well-proven scientific theorem. On the other hand, a conditional proof is partial proof, with limited viability, not a complete proof of absolute truth, with definite reliability. Yet, an unconditional proof (of a theorem or conjecture) derived from an incomplete and/or erroneous paradigm may be both falsified and replaced with a better proof of more effective theory.

**Technical proof:** A purely technical proof may rely on proven theory and/or conventional techniques. It requires no purely logical, elementary proof, nor any metatheory of enabling principles. A technical proof may be unconditional or conditional, partially valid.

Hundreds or thousands of examples are produced with QM mathematics and SM astronomy. Technical proofs need not explain or predict anything, and they rarely (if ever) enable better theory and metatheory. Therefore, in the pure sciences (etc.), technical proofs inevitably prove inadequate or simply false.

**Finitistic proof:** While ignoring the required enabling principles, David Hilbert and his followers did their best to formalize the logical 'rules' and metatheorems of maths and proof. They tried to establish the best, most logically viable (complete and consistent) rules of maths and proof. The assumption was that, to be reliably perfect, proof of a logical truth must completely, formally, demonstrate noncontradictory integrity (of the axiomatic system) enabling it. Otherwise, a flawed or deficient system might never enable viable proof and durable certainty.

However, Alfred Tarski's undefinability theorem and Kurt Godel's proof of his incompleteness theorem seemed to prove Russell, Whitehead, and Hilbert wrong about the possibility of success. So, increasingly, modern maths, number theory, and metamaths abandoned most of Hilbert's concerns and finitistic ideas. More recently, the Quine-Putnam "indispensability thesis" (QPIT) generated renewed interest in philosophical metamaths. Some important work, new theorems, and hypotheses (of finitism, idealism, realism, naturalism, and holism) were fielded. Yet, as shown with perfect proof (of **RH** and metamathematics), those attempts were neither fully satisfying, nor successful.

Indeed, despite all the benefits, Hilbert never fully defined his finitistic program, its terms, its basics, nor its paradigm. Thus, lacking full congruency with propositional logic and enabling metalogical principles, Hilbert's metamaths (and proofs) lack comprehensive definability and explainability. That proves the inadequacy of incomplete definition and inherent deficiency.

For the same reasons, modern metamaths, set theory, proof theory, and number theory (etc.) remained unfinished, incomplete, inconsistent (with logic and nature), and deficient. Therefore, they all suffer from refutability and deficient logical integrity. Likewise, defects of metamaths plague current QM physics, economics, and many other arenas of 'applied' science. Thus, this disproof of modern metamaths and QM pseudo-cosmology is an example of a perfect finitistic

proof of the holonomic ontological metatheory and metalogical principles of nature.

**Being:** The universe (all phenomena) and being are not separate events. Beingness is the essential expression of actuality, the most essential enabling principle of its nature. Being's nature is **a**) its intrinsic metalogical principles, **b**) subsidiary enabling principles (such as physicality, etc.), **c**) its qualities, **d**) its properties, and **e**) the processes that enable it (being). What exists is being; and what is not a part or form or process of being does not exist.

For example, nonphysical qualities and enabling principles are actual elements of being, so they exist. Thoughts, assumptions, theories, fantasies, dreams, illusions, and delusions exist (as nonphysical phenomena), but the unrealities perceived or believed do not exist. An important quality of being is its liveliness, energy, and action. By considering the whole of reality (the cosmos) as the presence or "field" of being (not mostly nonexistent emptiness + little bits of mysterious energy/matter) we can understand its liveliness as all pervading.

We can understand being because its intrinsic enabling principles of being empower and sustain its energy, properties, qualities, and potentials, including mentality and the existence of life—intelligent beings, species of beings—and constituent forms of being (mitochondria, viroids, DNA-RNA, proteins, elements, etc.). For example, the nature of being enabled human being as an embodied expression of its nature and potential. So, we can understand it because being enabled our awareness of it, its nature, and its potentials. (see the defs. of Mentality, Awareness, Nothingness, etc.).

**Nothingness:** For viable macro-ontology and meta-ontology, nothingness is an important logical principle. Yet, its actuality does not exist in any nondependently physical way. As nonbeing, "nothingness" means that which does not exist. As a condition of absence or lack, nothingness is knowable only relative to something or everything that exists.

Obviously, what does exist is everything, the totality of what exists, the universe. So, even what seems to be empty 'space' is indirectly detectable hyper-energy that enables, interacts, and moves with ordinary plasma, cosmic currents, galaxies, atoms, etc. Therefore, nothingness and all symbolic representations of it are things that exist only as psycholinguistic or psychophysical phenomena.

**Principles:** Principles enable natural phenomena, including other principles. They can also enable the existence and expression of new principles that were only pre-existent potentials of an enabling principle or ensemble of enabling/governing principles. So, though principles are immaterial (nonphysical) phenomena, they have morphic, structural, functional, and actual priority over all the mental/semiotic/physical phenomena they enable and sustain.

For example, though no other existential phenomena can have priority over a universe of all possibilities, potentials, and actualities, we can admit that it and all its virtual and material actualities are enabled and governed by its intrinsic metalogical principles, the most irreducibly elemental constituents, and properties of its nature.

Remember, the word "principle" comes from *principium* and *princeps*, for first, primary. Unlike other universal phenomena, principles are the most primal, primordial enabling elements of the universe. They enable the properties, qualities, and potentials of physicality and energetic phenomena. So, our perceptions and sensations of solidity and forces are actually of the embodiments and/or expressions of nature's enabling principles.

However, a principle is either a purely nœtic (virtual or psychic) phenomenon, or else a nonphysical element of logic or metalogical meta-energy. So, primal principles enable the beginning, foundation, and existence of everything. The primality and immutability of principles ensures that.

As elements of being, its most primal principles are generative elements of universal phenomena, the universe, and its infinite totality. Different kinds of principles enable the existence and interactions of beings and other universal phenomena, including the logical and metalogical principles and modes of nature. Being's intrinsic creativity is an example of a primal generative principle, enabling and being enabled by the other basic principles of being, like physicality and mentality. So, we can understand the realities of psychophysical energy and matter as complex results of the principles of nature's logic.

However, consider the prime dilemma of modern SM science. Some physicists believe that there is information—independent of any mind or mentality—in seemingly mechanical (non-living) phenomena, elementary particles or in 'dark' phenomena. Yet, they offer no explanation of how or why information could be present without mentality and semiotics.

In fact, materialists offer no explanatory information about mind, and a truly satisfactory definition of "matter" has been missing for more than a century. Yet, mentality is the fundamental principle that enables our creativity, intelligence, awareness, thought, and communication—as integral, universally pervasive potentials of being.

**POP:** In mathematics, the principle of permanence (**POP**) is essential to proof and verification of technical functionality (of equations, formulas, operations, theorems, etc.).

The **POP** enables durable reliability because no natural forces can change nature's nonphysical principles (enabling it, etc.). Likewise, The **POP** remains durably changeless. So, permanence is not simply an idea or concept dreamed up by mathematicians.

The **POP** exists because the enabling principles of semiotics, maths, logic, and being cause and sustain the changeless constancy and reliability of nonphysical, logical and metalogical phenomena (including mentality, maths, and proofs). Of course, if that were untrue, there would be no durably persistent natural patterns, forms, and modes of being and its elemental energy (matter, us, etc.). So, we can rely on nature's principles to keep on enabling actual and virtual reality.

Obviously, the definitive holonomic ontology of the cosmos, actual and virtual reality, of nature (and science) were enabled by the **POP**. Therefore, it enables holonomic metatheory of maths, science, and the proofs (and verification with logical and technical methods).

**Logic:** Typical dictionary definitions of logic usually rely only on logic's relationship with language, maths, propositional logic, and what makes sense within a context of shared knowledge, beliefs, biases, agreements, and artificial systems of axioms and rules. Yet, DNA encodes a quadrinary language of life. RNA embodies and expresses life's intelligence using a biochemical (molecular) trinary code (its language).

So, logically, we can accept the reality of nature's logic as a metalogical language of being. Clearly, nature's enabling metalogical principles are intrinsic expressions of its intelligence and mentality (the functional principle that enables mind, thought, science, etc.). Otherwise, DNA, RNA, human beings, and our languages and artificial logics would be impossible. In fact, maths can correlate with nature because its logic is enabled by natural metalogical principles.

So, nature helps us describe natural events, processes, and so on. So, maths may seem to be the language of nature or God. Yet, clearly, DNA and RNA prove that nature's language is being and all forms of expression and communication, its semiotics and meta-semiotics. Its meta-language is its metalogical principles, enabling and informing the meta-semiotics and existence of all things, all processes, and all beings.

Also, all ways of communicating depend on and express the meta-semiotics enabling them and their potentials. So, the principles and semiotics of the universe and all beings are nature's language, not maths, and not artificial logic. Nature's meta-logic is also nonphysical, sufficient, and necessary for enabling the totality of universal presence, and Life.

Nature's metalogical principles are of several basic kinds/classes:

- Original/actual: primal generative principles enabling all phenomena
- Formal/morphic: enabling all types, modes, and properties of form
- Structural: enabling all modes and properties of structure
- Functional: enabling and governing all kinds of functions
- Operational: primal principles of relativity and interaction

Clearly, the levels of nature's principles are nested, arising with and enabled by the original metalogical principles (of being). Morphic, structural, functional, and operational levels of principles are interdependent yet ordered per priority of their nature and potentials. Some principles, expressions, and embodiments evolve or derive directly or indirectly from and with the deeper levels of being. For example, all embodiments and expressions of morphic principles derive directly from and depend on the generative original principles. Yet, forms require and enable structure; and they enable functionality and operations, all empowered and enabled by relativity, actuality, and energy (the essential expression of activity).

Unlike artificial systems of logic and meta-logic, all subordinate principles of morphic, structural, functional, and operational metalogic are interdependent, ordered, and nested. They are emergent potentials and results, enabled by the more primal principles. Maths provides examples of practical systemic logic we can categorize as ordered, and others as bivalent, existing as both nested and ordered expressions of semi-artificial logic.

Some of the greatest hypotheses, conjectures, and theorems of the great pioneers of science and maths deal with multivalent nested logic. Yet, all kinds of logic depend on and express enabling metalogical principles. Therefore, understanding the enabling principles enables the best proofs of hypotheses, theorems, and realities expressing those principles.

**Property:** The principles that enable and govern all phenomena give them their characteristic properties. Properties are also integral to principles.

Form, structure, function, relativity, and the other principles of being, give each phenomena its unique properties, its actuality, its identity. For example, the sequential arithmetic progression  $\mathbb{N}_{5 \rightarrow \infty}$  (from  $0 + 1, n + 1, \dots \rightarrow \infty$ ) is unique, always what it is, not like any other operation or result of maths. The changeless principles and properties that make it so, ensure identical results with every instance of its use.

Property, the principle, is essentially important to the holonomic metatheory of post-modern metamaths, meta-ontology, and macro-ontology. The defects and crises of metamaths, unethical economics, current physics, and 'QM cosmology' are partially caused by a pandemic failure to understand the nature of property and properties.

**Form:** Form is the primal morphological principle of being that enables appearance or presence and the shapes or modes of things and bodies.

Despite the opinion of architectural sophists, form does not follow function. Form, structure, and function are inseparable, interdependent, and integral to all phenomena, either virtually or overtly. Yet, to exist, everything must have a form, even the undetectable seemingly formless field of 'dark' stuff we thought was empty space.

Even the most basic principles, at the very subtle level of nœtic phenomena, have form, logical structure, functionalities, and operational potentials. Elements and components of structure have forms. Without form there can be no structure. However, because of relativity and integrity, the metalogical principles, there can be no form without formlessness. Like nothingness, formlessness has only virtual existence relative to what it is not, each and every actual thing, however subtle or virtual. The primality of form is self-evident by the fact that every kind of structure is the structure of a form of being or a thing, and every component of a structure has some kind of form.

Forms can be seen and known as dimensional, as shapes or appearances, or as nondimensional, like principles of logic and ideas, or other subtle, virtual forms. So, the form of form, the principle, is all forms, including itself. Emotions, speech, and sounds are examples of subtle, transfinite forms. Numbers and other symbols have very subtle, virtual forms, expressible as actual forms, objects of perception and consciousness. The nature, attributes, properties, and potentials of forms are determined by the basic metalogical principles they express and/or embody.

**Structure:** Structure enables and sustains the forms and integrity of phenomena, all things, and all forms of being, even principles, numbers, and identities. Structure enables the durability of all principles, elements, molecules, cells, organs, bodies, groups, cultures, societies, organizations, systems, and languages.

For example, maths is a language and a logical system of symbols, values, functions, protocols, rules, and procedures enabled by the principles, attributes, properties and potentials that constitute its structural logic. The nature, properties and potentials of various structures are determined by the varying degrees of basic metalogical principles they express and/or embody.

**Functionality:** Without understanding the nature, metalogic, and actuality of functionality, fully understanding the nature of numbers, maths, functions, and semiotics is impossible. The

functionality of maths and maps is not a magical invention of mathematicians.

Minds and logicians exist because functionality is essentially a metalogical principle of being. The convenient relationships of mathematical functionalities to physical functionalities are no accidents of a mechanical cosmic automaton. In the explicate, overt order of existence, function is subsidiary to form and structure. Yet, in principle, functionality is integral even to the basic generative principles of being, the primal metalogical principles, and to every embodiment and expression of form and structure.

Thus, we can understand the principle of functionality as intrinsic to all expressions of activity and energy, to the nature of being-as-a-whole, and its momentary totality.

**Relativity:** Albert Einstein did not invent relativity or dream it up. Universal integrity enables and sustains the logical relativity of all principles, phenomena, and potentials. Without relativity, the principle, the whole of being would lack integrity, symmetry, asymmetry, nondual polarity, complexity, simplicity, and other complementary relations required for being, life, awareness, consciousness, maths, and science.

The distinct relativities of overt phenomena (we think of as physical) are expressions of actual relativity (of the essential principles that enable and sustain them).

Plato was relatively correct, in principle. Nonphysical and mental phenomena are more real than all the ever-changing phenomena we perceive and think of as purely physical. Yet, conversely, science and maths are retarded by the idea that governing principles, symbols, numbers, functions, and their potentials are purely mental fabrications, unrelated to being and the enabling primal principles of its nature. However, mathematical symbols, protocols, and operations are natural, logical, psychophysical phenomena, relative to everything else.

For example, all phenomena—including mathematical expressions and the realities they represent—are as inseparably interdependent as the principles of physicality, mentality, and the other nonphysical principles that enable and sustain them. In fact, the whole of being, the totality of absolute reality, is nondual, neither purely physical nor only virtual/illusory.

Literally, essentially, and indeed, all beings and other phenomena are enabled by and/or with virtuality, physicality, and mentality. Our dichotomies and anomalies are artifacts and defects of human languages, sociocultural conditioning, and normal modes of thought, not defects of natural relativity (which is constantly perfect). Therefore, fully understanding the metalogical principle of relativity is essentially important to the theory, metatheory, and understanding of being, science, maths, and proof.

**Symmetry:** Symmetry and asymmetry are nondual aspects of form, structure, relativity, unity, integrity, individuality, and reciprocity. So, the symmetry of a pattern or a thing or group of things is perceivable and/or knowable only in relation to what is asymmetrical. That relationship can be seen in all forms of life at all levels, from the cosmic to the mineral, vegetal, animal, to the cellular, the viral, viroid, DNA-RNA and submolecular scale.

Every kind of mind, brain, body, and species would be impossible without the intrinsic symmetry and asymmetry of nature's metalogical principles. As primal expressions—of form, structure, relativity, and reciprocity—symmetry and asymmetry can be seen in the numeric structure and sequences of all primal numbers (primes) and their reciprocals. The relationship of primals and composites in a series or field of whole numbers is a prime example of asymmetry existing only in relation to symmetry. Numeric inequalities are expressions of

asymmetry's logical inequality with symmetry.

The intrinsic symmetries and asymmetries of numbers and other phenomena are non-optional (nor accidental or fictional), nor simply inventions of mathematicians.

Equations are mathematical examples of logical symmetry expressed with equality, but asymmetrical values may be on both sides (of " $=$ "). As with singularity and duality, or individuality and multiplicity, the principle of symmetry exists only in dyadic relativity with asymmetry, its logical opposite. For example, the nature of the rational expression for 1 divided by 2, can represent unity divided by duality, yet also the dyadic relationship of logical asymmetry (1 and  $1/2$ ) and symmetry (2 and  $1 + 1$ ).

One side of a symmetrical image is a mirror image reflection of the other side. In Riemann's famous graph, "the line of symmetry" ( $x = 1/2$ ) reflects the symmetry of the 2 sides ( $-$  and  $+$ ) that meet at zero ( $y = 0$ ). Obviously, the logical realities and enabling metalogical principles make it impossible for Riemann's zeta function not to generate nontrivial zeroes only on the line at  $1/2$  (unity divided by duality). It also expresses the asymmetry of nothingness divided by the primal symmetry of the unity and totality of reality.

**Creativity:** Creativity, the functional principle, is intrinsic to being as a whole. Whether there was a sudden beginning from absolute nothingness nowhen, with a big bang of everything in the middle of nowhere, or an evolutionary emergence from a beginningless infinity, creativity was essential, at least as a potential or implicate principle. The universe exists, as it is, thus creativity exists, and vice versa.

The principle of creativity can be seen in the existence of the universe itself, by the existence of physical and nonphysical elements, in the ways of living beings, in artists, even in the works and results of the pioneers of maths. In fact, this dictionary of meta-ontology, the definitions, explanations, and understanding of reality are enabled by natural creativity.

**Causality:** Causality in science and maths fell out of favor by the time of Euler (who convinced Goldbach to quit believing in the primality of 1, unity, rationality, etc.). However, in reality, the intrinsic principles of being enable and sustain its logic and transient (changeable) phenomena with relativity, reciprocity, regularity, and the functionality we know as cause and effect.

So, all effects have causes, and all causes have effects. Hence, we can be sure that results and the quality of results are related to interactions that produced them.

For example, believing that the expressed primality of the numeric unit symbolized by "1" is irrelevant to the logic and understanding of numbers is clearly a result of irrational thinking. Thus, since irrational thinking always leads to inappropriate or harmful decisions and actions, we know that it is defective, an example of mental deficiency, *i.e.*, insanity. Therefore, we can be sure that the results of irrationality are related to their causes.

Because the principle of causality is integral to all phenomena and their enabling principles, we can also be sure that maths and the cosmos are results of causes and enabling principles (of being's nature).

**Regularity:** Buddha was right about transient things being impermanent. Yet, the morphic, structural, and functional properties of regularity, the principle, enable the results of arithmetic progressions, even in the exotic domains of complex algebraic geometry, post-Riemannian topology, and QM maths. That is so because the constant, nonphysical principles of numeric

and mathematical logic (and rules)—enabled by metalogical principles of being, form, structure, function, and relativity—rule mathematical functions, operations, and semiotics. Thus, using any kind of maths properly never causes dysfunctional irregularities.

That regularity is a metalogical principle of being is proven by an ever-increasing number of studies of physical, geological, biological, and statistical evidence. That truth is shown and known as the Newcomb-Benford curve (or first digit rule), the natural distribution rule (**NDR**). Clearly, nature and regularity support logical and mathematical principle of permanence, and all other enabling principles of being.

So, regularity enables viability, reliability, and certainty. That truth supports the importance of regularity as an essential element of post-modern metatheory of science, maths, logic, and proof.

**Integrity:** Integrity, the structural principle, enables and sustains primal unity and identity, the unique individuality of each entity and thing, and of the universe. The expression or embodiment of integrity depends on other metalogical principles, mainly actuality, reality, identity, form, structure, functionality, relativity, reciprocity, regularity, and permanence.

Obviously, beings, forms, structures, functions, and systems would be unsustainable without integrity. The formal, structural, and functional logic of maths, its results and proofs would be impossible without integrity. In fact, without integrity, there could be no logical principle of permanence to ensure that viable functions and formulas that work with integers also work with complex numbers in analytic algebraic geometry.

The constant nature and properties of numbers, equations, formulas, algorithms, and graphs all depend on integrity that sustains the principles governing them and their potentials. The logical integrity of arithmetic is an expression of the natural integrity of the metalogical principles of being itself.

For example, integrity enables the primality, relativity, and the identities of 1, 2, 3, and all the other primal numbers. Integrity also enables and sustains the complementary relativity of simplicity, complexity, symmetry, and asymmetry seen in the relationship of the primal and nonprimal numbers.

Integrity enables and sustains the interdependence of all phenomena and potentials, including truth, falsehood, reality, and unreality. So, truth, reality, and proof are characterized by integrity. Unreality and untruth lack the logical and actual integrity of natural congruency.

Logical integrity ensures the reliability of the nature of maths and the nature of life, making it a fundamental essential of proof.

**Primality:** Primality is a metalogical principle of form and structure, not simply a concept or invention of mathematicians. Primality is intrinsic to being and nature's original metalogic. Primality is intrinsic to identity, and an expression and property of unique individuality. Mathematical and numeric primality is an expression of original primality.

For example, original unity and universal being are *a priori* (pre-existing) expressions and embodiments of metalogical primality. Numeric primality reflects the primality intrinsic to all phenomena in each unique state of the whole, and each subsidiary identity. Primality is an intrinsic aspect of every embodiment of originality, the most primal is the universe itself. Hence, 1 is the primary, logical numeric symbol of primal priority.

Remember, primality, causality, and creativity are interdependent principles that enable each new state of being's presence and intelligence. All other principles, properties, and



expressions of being, form, structure, function, and operation exist in interdependent relationship with identity and its primality.

So, the primacy of natural meta-logic is primary and prior to all other expressions of primality. The unity and integrity of being are infinitely pervasive in each new moment of presence, making primality intrinsic to all things, beings, and moments that express it to any degree.

**Priority:** Priority is a principle, property, and subordinate expression of originality, primality, and relativity. Priority is also a property of ordinality, and a reciprocal opposite of posteriority.

Priority is enabled by mentality, actuality, causality, validity, reality, identity, integrity, reciprocity, and regularity. Without priority, primacy, numeracy, counting, initiation, succession, progression, maths, metamaths, measurement, analysis, evaluation, organization, and effective communication would be impossible. For example, discovering and verifying *a priori* (pre-existent) principles and facts of nature enables development of better theory and metatheory. Therefore, priority is fundamentally essential to proof and holonomic, holotropic metatheory. Also, the axiological and metalogical actuality and superiority of theory proven valid, gives it qualitative priority over obsolete theory proven invalid or inadequate.

**Identity:** The existence of intelligence, knowledge, and consciousness imply and confirm the existence of identity. However, the nature of identity seems generally unknown, which seems deeply problematic, possibly catastrophic.

For example, identity is a primal metalogical principle of being, intrinsic to the nature of the universe. So, naturally, the nature of identity is essentially determined by other enabling principles. Obviously, there are personal and impersonal kinds of identity. Yet, the existence of any kind of identity requires and involves the enabling principles listed below:

- Actuality, physicality, mentality, reality, and presence
- Form, structure, functionality, relativity, activity, and energy
- Individuality/singularity, integrity, unity, duality, and multiplicity
- Primality, relativity, reciprocity, regularity, immutability, and mutability

**Individuality:** Individuality, like personality, is a commonly unrecognized principle of being. Individuality is an aspect and interdependent expression of identity, singularity, integrity, and relativity.

The universe is the primal embodiment of individuality, expressed in and as each and every subsidiary phenomenon. Each principle, each idea or thought, each symbol, every elemental form and function of being (every molecule, compound, cell, organ, and body in the universe) embodies and enacts individuality. Without the intrinsic metalogical principle of individuality, there could be no identity or unity, nor relativity and complexity, and no diversity. Logical, virtual, and actual individuality can be finite, definite, and infinite.

For example, the actual individuality of phenomena and forms of being can be as transfinite as any infinite set of unique totalities. Thus, macro-ontology, meta-ontology, and holonomic metamathematics affirm individuality as a primal enabling principle of form.

**Multiplicity:** It enables the existence of more than one phenomenon, of quantities, qualities,

and multiple properties. The primal metalogical principles of being enable multiplicity, a subsidiary principle of form. It is a relative complement of singularity and individuality. Multiplicity also enables numbers, mathematics, multiplication, productive replication, and the procreative propagation of living beings.

**Unity:** In maths, there may be an infinity of roots of unity, but only 1 taproot of infinite unity, integrity (the primal enabling principle). Physically or virtually, unity requires, expresses, and embodies the primal integrity and harmony of components, elements, or constituents of a whole thing (being, the cosmos, etc.).

A single unit of some kind is called a unit because it is 1 embodiment or expression of unity, an undivided wholeness. Unity is also realized as the presence of a dyadic, triadic, primal, or composite phenomenon, a thing or concept, an entity or identity, or the whole universe. As a metalogical principle, unity enables a state of oneness, of being at one or conjoined as one with another or with all things.

So, the universe is the original embodiment and expression of unity, and that confirms the integral presence of its original metalogical principles. The interdependent relativity of identity and infinity sustains unity, as in the definite identity of an individual being, with an ever-changing actuality of infinite complexity sustained by constant multiphasic interactivity. Singularities, dyads, triads, and sets are expressions of unity.

The simplest expression of unity is the relationship of two phenomena, like physicality and mentality, or unity and multiplicity. The existence of unity may be psychophysical or sociocultural, simple and/or complex, definite and/or infinite. The logical numeric expression of unity is that of 0 and 1, or just 1, representing the unity of numeric logic and all numbers. That is so because unity and identity can only exist in relationship to something other, such as duality, diversity, disintegration, separation, division, multiplicity, or nothingness (etc).

The logical interdependence of disunity and unity make them a prime example of primal dyadic unity. Primality is always integral to unity and vice versa. Ultimate unity is embodied and expressed as the wholeness of universal reality. No expression of unity has greater primality than the prime primal  $P$  or the number 1, symbolizing primal unity and its logical and actual integrity. Its primal primacy makes unity a prime expression of primality.

**Equality:** Without the principle of equality there would be no equations, no arithmetic, no logical equality of 0, 1, and 2 (as natural whole numbers and members of the primitive triad). The equality of the maths of continuous and discrete phenomena is revealed by the 'nontrivial' zeroes at the line of symmetry (at  $1/2$ ) generated by graphing Riemann's Zeta function ( $\Re_{\zeta}$ ).

In fact, the equality of  $1/2$  and  $-2$  is confirmed by  $\Re_{\zeta}$  (and the nature of 1 and 2), confirming the primal relativity of 1 and 0. So, equality, identity, unity, and integrity are interdependent, relative functions of each other. The basic principles of primal intelligence and macroscopic phenomena are logically equal constituents of universal totality. Some may dispute that, but the reality of being is all equally necessary things, beings, events, and processes.

So, despite assumptions, opinions, judgements, prejudices, preferences, and aversions, the basic logical value of an element, a principle, a system, a number (or some other symbol) equals all others. For example, as numerical symbols, as concepts, and as elements of mathematical logic, the primal (prime), odd, and even numbers have equal importance. Also, in principle, the intrinsic value of finite phenomena (or symbols) equals the value of infinity. For instance, all

physical things and beings emanate energy and constantly change (microscopically, etc.), yet remain what they are, finite yet infinite.

The interdependent functionality of equality and relativity make each element of a dyadic expression (of relativity) an equally distinct, unique identity, of logically equal and absolute value. So, like awareness and appearance, each number and its symbol are equally finite and infinite and transfinite, in principle and fact.

**Simplicity:** Simplicity is a subsidiary principle of form and structural meta-logic, intrinsic to and enabling all other principles and irreducible expressions of numeric logic and geometric metalogic. Unity, individuality, integrity, form, structure, and complexity enable and are enabled by the actuality and possibilities of simplicity. Naturally, simplicity and complexity are logical, interdependent complements of each other.

Evidently, realizing that, Einstein saw that “everything should be made as simple as possible, but not too simple.”

Complication is the negative, noncomplementary opposite of simplicity. Typically, the more confusing a situation, system or theory becomes, the more complicated and estranged it is from natural metalogic and reality. Thus, powerful, deeply explanatory, elegantly simple theories are typically the most accurate.

Occam, Newton, and Einstein were not the only fans of the natural potency and relevance of simplicity. Nor does it take scientific expertise to recognize, understand and appreciate the importance of simplicity. Even children and lucky fools can appreciate it..

**Complexity:** It, the principle, belongs to the logic of form, structure and morpho-structural meta-logic. So, both simplicity and multiplicity can be expressed and embodied as complexity. That is so because simplicity is the interdependent logical complement of multiplicity, the prerequisite of complexity.

A complex phenomenon is not necessarily complicated. The whole of universal being and logic are prime examples of complex phenomena compounded of the simplest elements, principles. Actual complexity is a primal requisite and result of nature’s negentropy because, as complexity increases, so do potentials and the flow of energy, enabling new forms of order, interaction, and change.

Complication retards progressive change and smooth flow of energy, decreasing orderly interaction. Actual expressions of complexity pose no problems for logic ecotects, computers, logic infrastructure. A simple theorem or formula (like  $RfZ$ ) can relate to infinite complexity, enabling more complex operations, interactions, and further development of complex results. Yet, a complicated theory or logic infrastructure may be based on mistakes, misconceptions, erroneous assumptions, misinterpretations, misperceptions, and/or inferior logic. Thus, defective theory can and does decrease creative interaction, development, and successful evolution.

**Totality:** Totality, the metalogical principle, enables the existence of a) all qualities, elements, and potentials of a form or mode of being, or b) of a set or group or field of phenomena. Universal totality ( $U_T$ ) is all phenomena, everything, the whole of being, including its principles and qualities. That also includes what is present and/or expressed only as potentials, ideas, virtual symbols, and imaginary or illusory phenomena.

Naturally, totality includes the results of the past and memories, but not what no longer exists, or never existed, nor what may happen in the future (except as dreams or imaginings or potentials). So, totality cannot include or begin as an impossible yet seemingly endless, boundless expansion of nonexistent nothingness into everything from the middle of nowhere.

Recall that, so far, what we can detect of  $U_T$  is at least  $\pm 93$  billion lightyears in diameter, with ultra-colossal currents of plasma and galaxy superclusters (entering and exiting and almost crossing it). So, we can be sure that  $U_T$  is immeasurably larger and “older” than the imaginary Big Bang. Also recall that, beginnings, explosions, and initial conditions require energy, and energy requires something other than nothing, nowhere, and nowhen.

We can think of cosmic totality as the infinite whole of reality, greater than the sum of the individual totalities of every subsidiary form of being, every person, place, or thing in the current moment of universal presence (including all its nonphysical enabling principles). For example, the ever-changing complexity of each human life is immeasurably greater than a sum of its physical parts. That makes us infinite and transfinite expressions and embodiments of universal being and its intrinsic enabling principles. That ensures the infinite totality of being (the universal macrocosm).

In fact, as far as we now know, humanoid beings may be the only beings who can embody the totality of all universal principles. Hence, if universal totality came from anything before physical phenomena, the most likely source is undetectable hyper-energy and the meta-energy of its metalogical principles, properties, and qualities (still enabling and sustaining universal phenomena and us). If true, then each symbol or number expressing primal totality is as infinite as the infinite totality of all phenomena. That is so because each level, mode, and realm of reality (including the mental, virtual, and meta-energetic modes and domains) is infinite.

**Infinity:** Hilbert believed that infinity is essentially important yet inscrutably mysterious. Universal totality, the ever-changing wholeness of being, is the original, all-inclusive expression and embodiment of infinity, the principle. Except for principles, the actual conditions of universal phenomena (and beings) are constantly transient, making them both transfinite and infinite.

The logical identity and psychophysical or metaphysical actuality of principles, ideas, and virtual numbers are constantly definite yet boundlessly immaterial, thus changeless, thus infinite. That can be understood as an integral microcosmic expression of the dyadic relativity of all finite identities and all infinities. The interdependent relativity of principles, forms, structures, functions, relations, entities, and interactions enable all finite and infinite forms of existential phenomena.

So, we can think of and represent universal being and its actual totality—enabling and enabled by its infinity of integral metalogical principles—as the ultimate infinite set that includes itself, and the transfinite null set,  $\{0\}$ .

**Quantity:** Like dimensionality, quantity is a subsidiary principle of the metalogical principles of being, specifically: form and structure. Naturally, embodiments and/or expressions of quantity are also enabled by other primal principles: physicality, mentality, awareness, cognitive perception, consciousness, and so on.

Expressions and embodiments of quantity are all psychophysical phenomena enabled by the principles of relativity, integrity, individuality, unity, and multiplicity. Also, all perceptions of quantities are relative to perceivers' qualities, conditions, conceptions, and metrics.

Without the principle of quantity nobody could perceive things as either few or many things. Numerous or scarce, large or small, seeing and knowing more or less of something require quantity, the principle. Fully understanding and appreciating the vast scale of the field of being (the cosmos) and its subfields (including us) requires real understanding of quantity. Otherwise, as is normally the case, we tend to confuse notions and illusions of quantity with the reality.

Notions of money and wealth are perfect examples of imagining illusory quantities. Worse yet, without realizing the true nature of quantity, we all too often confuse its value with the value of quality. Then, we too often prefer illusory quantity over real quality. That error pervades current SM paradigm science and maths. Yet, without understanding the different kinds of quantity and value, real, unreal, etc., there can be no qualitative progress in science or maths.

For example, confusing quantity with quality (and vice versa) makes it impossible to recognize the importance of a) intrinsic metalogical principles of life, b) natural reality, c) hyperfluid mechanics, d) plasma physics, e) metamathematics, and f) sanity (etc.). That prevents or retards understanding and development of better theory and metatheory. So, quantity, the principle, is essential to holontology, macro-ontology, and post-modern science.

**Quality:** We normally encounter it as a subjective, psychosocial construct or concept (or imagined per personal consciousness via culturally induced bias). Yet, quality, the principle, like property, is an integral principle and property of the enabling metalogical principles of being.

In fact, quality enables the qualities and potentials of all other primal principles of being. It also enables the existence and qualities of real values, and of numeric and symbolic values.

Thus, quality enables counting, measuring, mathematics, and science, especially bio-ethical axiology, the science (and study) of natural values. Conceptions of quality vary from person to person and from culture to culture, sometimes from moment to moment.

Yet, within the various orders, classes, and types of phenomena (including beings), phenomena clearly exhibit qualities and degrees of quality. Without it, sanity, analysis, science, maths, art, and technology would all be impossible. If quality were not a primal natural principle, then there could be no wellness, illness, inferiority, superiority, excellence, beauty, and goodness (etc.). Also, because of it, liquids exhibit the qualities of wetness, fluidity, viscosity, deliciousness, and so on. Likewise, different kinds of stone embody qualities of solidity, hardness, density, beauty, and so on.

The characteristic qualities of properties (of nature), elemental composition, and structure depend on it. Plants and fungi have qualities of living beings, and of foods, medicines, poisons, and much more. Living beings embody and express the qualities determined by the nature of their species, their individual nature, their capabilities, potentials, limitations, behaviors, habits, and relationships (to other beings, groups, places, and things).

So, the qualitative aspects of reality are essential to the whole of being and its subsidiary phenomena. High quality habitats, communities, thoughts, emotions, communication, semiotics, science, maths, logic, technology, and arts are important to us because high quality of life is good for us. Human intellect depends on and expresses the quality of each of us (and of our knowledge and/or wisdom).

If the principle of quality were not intrinsic to being, then intellect would have nothing to enable effective analysis or to prove valid theory and knowledge. Without quality, there could be no ethics or justice, no compassion or humanity, no good, no evil acts, no words and thoughts, no art, no music, no architecture nor engineering, no validity, and no viable society worth sustaining.

**Validity:** Truth is both a principle and a concept, enabled by validity, actuality, and reality, the principles. Truth, the concept is multivalent, depending on the context and its domain of discourse. Validity, the principle, always makes truth the opposite of false (invalid or unreal) phenomena or claims.

Essentially, absolute truth is what is ultimately valid, or real, beyond or before or without us and our opinions. Yet, our intellect is a dualistic function of mentality, enabling categorical perception of relative phenomena, mainly our experiences, perceptions, and ideas about them, this, and/or that. That enables the existence of relative truth, conditionally valid concepts, and assumptions.

For example, the principle of mentality enables perceptions, conceptions, consciousness, intellectual discernment, illusion, delusion, and evaluation of results of interaction. That gives rise to knowledge of relativity, distinctions, identities, differences, similarities, qualities, values, and ethics. So, essentially, relative truth is a principle of practical logic enabling its own functionality as an element of semiotic and provisional logic. Relative truth is also a resultant variable of sociocultural norms and semiotics, a derivative of the linguistic logic, ideology, and dominant paradigm of a host culture.

Without a paradigm based on a metatheory of nature's actual metalogic, socialization and conditioning make some confusion about the nature of truth inherently unavoidable. The more socially generated bias, the more the confusion about truth. The definition of truth in an

unbiased, purely logical metatheory explains truth as reality, an actuality. For example, a true statement expresses concepts or perceptions congruent with natural reality, or it may describe the nature of a person's activity, or of a place, an event or thing, or a principle. That truth is what makes the valid metatheorems of a well-founded metatheory true and provable within the context of its own paradigm and domain of discourse.

**Virtuality:** One of the metalogical principles enabling and sustaining phenomena that exist beyond materiality and physical interaction is virtuality. Fundamental principles, such as logic, mentality, personality, and materiality (physicality) are virtual yet actual elements of being.

Just as water is not *in* or *behind* ice, data and metadata are not *in* or *beyond* the semiotic representations used for transmitting or computing with them. Similarly, mental or virtual phenomena and principles are not *in* or *over* or *beyond* any forms we normally think of as physical. Thanks to the metalogical principles of form, structure, integrity, physicality, and dimensionality, we can use the properties and concepts of dimensionality to help us think about reality. For example, they are virtual mental constructs, but we can think of various domains and properties of form as dimensions or spaces. Hence, we can understand virtual expressions of nature's metalogical principles as pervading space (and all other phenomena), while belonging to a different order of being.

Physicist David Bohm saw the universe as holonomic, having implicate and explicate orders of being. Bohm missed seeing physical phenomena as embodiments and expressions of nonphysical principles (required for their being). Hence, domains of meta-energetic and nœtic (cognitive or psychophysical) phenomena are virtual modes of being.

Holonomic theory and metatheory provide more descriptive and suggestive explanations than all the fantastic pronouncements about "dark" stuff and 'God' particles (causeless, accidental, virtually magical cosmic glue). Bohm's holonomic hypothesis was inspiring, but incomplete, a promising yet inadequate explanation of what modern science knew via technology of the 1970s. However, we all live, interact, talk, and think by virtue of nonphysical enabling metalogical principles, knowable as such. In other words, our theorems and equations are linguistic, semiotic expressions and results of the actual elements of nature, and its metalogical principles.

So, nobody will ever discover a subatomic particle that generates, empowers, and sustains awareness and the principles enabling, empowering, and sustaining universal phenomena. Clearly, looking for physical causes of nonphysical phenomena and principles that enable, empower, and sustain physical, psychophysical, and mental realities is an absurd exercise in futility.

**Reality:** Most of us seem to take "reality" for granted, except when thinking and acting as if it must be a matter of opinion. However, that notion is a prime motivator of corruption and institutionalized confusion and delusion.

For example, for effective science and maths, a valid, unambivalent definition of reality is essential for proof of truth and untruth. Hence, if science and ontology are to progress to a superior, post-modern era of theory, metatheory, and praxis, disambiguation of "reality" is a nonoptional necessity.

Consider maths, metamaths, QM, SM cosmology and physics in general. They all started stagnating as popularization of notional/personal reality was increasingly accepted and

institutionalized as the new, post-theistic justification for ethical & anti-ethical, moral & immoral, and amoral 'relativism' (with decreasing interest in valid logical relativity and actual reality). The worst of it is SM cosmology, now well beyond 99.9% illusion, conjecture, misconception, and misinterpretation.

So, we now need an irrefutably viable, holonomic definition and understanding of reality that supports transition to post-modern science and society (and to survive the consequences of modern civilization's deficiencies and atrocious excesses). Also, in general, what is real is whatever is truly expressive of the principles and actualities of universal being. Naturally, that requires valid, or at least optimal theory and metatheory of valid macro-ontology, and acceptance of the actualities of being.

Still, acceptance is optional. However, disputing and attempting disproof of the necessary sufficiency of good theory, its basis in actuality, and logical truth, makes realism's opponents guilty of self-negation and foolishness. For example, the relativity of personal/conceptual 'reality' and pre-existent cosmic reality can only be falsified by disproving the validity of logic and actual reality. Yet, any argument against cosmic reality would invalidate the reality and viability of mentality and being (and be the ultimate logical fallacy).

**Dimensionality:** Dimensionality, the principle, is a subsidiary property and aspect of the interplay of form, structure, functionality, physicality, and mentality (the enabling principles). Of course, that fact of being is enabled by relativity and integrity, which enable and sustain our perceptions and conceptions of dimensionality's properties (space, distance, depth, up, down, etc.).

Dimensionality enables the development and use of psychophysical and purely mental conceptual constructs for the sake of thought and communication. Unfortunately, careless use and abuse of the term "dimensions" (in physics and maths) caused and perpetuates an unfortunate state of general confusion. For example, dimensions do not exist in any pre-existent, concretely physical, independently real way.

The use of the term "dimension" in maths has a strictly mathematical definition that makes it convenient for thinking about various mathematical objects and results. Yet, dimensionality, the principle, enables perceiving, describing, and interacting with phenomena enabled primarily by form and structure. So, the popular notion of 3D "space" mistakes perceptions and misconceptions as realities (of the field of being and its attributes of dimensionality).

Likewise, believing in multiple dimensions or reality in a curvy "space-time" geometry is caused by misunderstanding the principles of dimensionality, physicality, activity, and reality (etc.). For example, at well beyond 90 billion lightyears in diameter, the cosmos is either infinite or so inconceivably vast that it can be considered a boundlessly infinite sky-ocean, without up and down, no height, width, or depth. Only dimensionality, the nonphysical principle, enables perceptions, measurements, and ideas about any kind of form's spatial properties.

So, we may as well believe that the universal regime of hyper-luminal energy enabling, infusing, and affecting galaxies and all other energy phenomena is one whole event or single phenomenon, not curvy, multi-dimensional spaces, exploding in a nonexistent continuum of magical QM maths. Like space in a room and its dimensions, empty "outer" space is a mental phenomena enabled by our senses, social conditioning, and a principle and property of form, dimensionality.

If the universe had an actual dimension, then it would be the all-inclusive infinity of its field



of being, life, and energy, enabled by integral metalogical principles. The extra 4<sup>th</sup> dimension in QM's probabilistic-statistical maths (and post-Einsteinian notions) seems a useful mathematical fiction. However, it should trick nobody into believing it represents a self-existent yet totally illogical, mysterious thing, "time" (the illusion or delusion). Yet, all of QM and mathematical dimensions are enabled by truly real and reliable enabling principles. (see defs., Principles & Logic)

**Physicality:** Like mentality, physicality is a natural metalogical principle that enables the embodiments, expressions, properties, and qualities of its nature and potentials. In fact, the primal metalogical principles that enable physicality (and its properties) are what enable its forms, functions, effects, and our perceptions of them.

Because the nature and actuality of physicality and the other metalogical principles of being were neither recognized nor fully considered, most modern scientists have lacked a generally accepted definition and explanation of physical matter for decades. Of course, we now have abundant evidence and proof of the logical relativity and interdependent potentials of physicality, mentality, and maths. Yet, until now, mathematicians—including Riemann, Gauss, Euler, Euclid, and Pythagorus, among others—clearly failed to fully recognize the nature of the principles enabling, empowering, and sustaining them.

However, some visionary pioneers of ancient times came very close to understanding matter. As expressions of principles, some early thinkers intuited a nonphysical source of physical things, beings, and processes. Yet, they failed to realize optimal understanding. Now, free of confusion about physicality and mentality, nothing restricts realization of the inseparability of the expressions and embodiments of physicality and mentality, the principles. Embodied and/or expressed in dyadic actualization of primal creativity, life, and cosmic phenomena are enabled and sustained as integral expressions and embodiments of being and its magneto-dielectric 'field' of energy (and their enabling principles).

Energy, thought, information, communication, bodies, and the activity of living beings require physicality, yet it is enabled and sustained by the meta-energy enabling the metalogical principles of nature. Otherwise, there could be no action or motion, nothing to move, no time to move anything, no elements, no explosions, no DNA and RNA, no bodies, nothing to serve as media for communication or the encoding of information by intelligent beings with minds. Without the meta-energy and metalogical principles of physicality there would be no plasma, no stars, no galaxies, no fuel, and no physical properties to sustain them.

All phenomena contain at least the essence of physicality, the integral potentials of being, form, structure, and function. They enable the existence, properties, qualities, and potentials of integrity, dimensionality, energy, and force. So, instead of believing in partial descriptions, as if they were realities, we can and should follow the example of the ancient Buddhist sages. They saw elemental energy and 'matter' as psychophysical phenomena. Instead of believing in solid, permanent particles of stuff, and settling for an inscrutable equation ( $E = mc^2$ ), they understood the psychophysical constituents of existence as solidity, cohesion, motility, temperature, and color. Of course, those five subsidiary principles and properties make things perceivable. Yet, no things, bodies, and beings would be knowable without the universal enabling principles and presence of awareness.

In other words, we can think of "atomic" energy phenomena simply as energetic events or processes expressing the principles and properties of the objects of perception we experience

(by virtue of our senses and cognitive functions).

However, from the impossible perspective of a mindless, purely mechanistic universal field of magic energy, without pre-existent principles (like physicality and mentality), there could only be an infinite wholeness of totally formless no-thing-ness [*sic*], without forces, objects, parts, bodies, and places; and no beings, no minds, no logic, no principles, and no processes, anywhere. So, clearly, forms, elements, things, places, biomes, organisms, and conscious selves would all be impossible in a cosmos without physicality and the other enabling metalogical principles of nature.

**Mentality:** Like physicality, mentality is a functional principle intrinsic to natural metalogic, yet subsidiary to primal principles. Natural functional logic and mentality are prerequisites of intelligence, of thought, communication, semiotics, maths, and other expressions of the potentials of practical logic and the more primal principles of existence.

The reality of mentality as an intrinsic principle of universal being is proven by the presence of mathematicians and readers. If mentality were not an intrinsic universal principle, at least virtually, as potential, then maths, writing, reading, mathematicians, writers, and readers would be nonexistent. If that were the case, information could not exist.

Because of mentality, some beings with natural bodies and minds can dream and remember or imagine a fictional universe with only purely mechanical entities. AI-enhanced supercomputer systems are mechanized expressions of our mentality, but they have none of their own. To simulate intelligence, mindless computers require prior invention and initial programming. Their sets of instructions are created by natural beings who embody and express the properties and potentials of intrinsic mentality.

**Sanity:** The nature of being and relativity enable the potentials and phenomena of possibility, causality, mentality, and sentient beings. For example, because of possibility and mentality, phenomena may be illusory or actual or virtual or a combination of those qualities. Sanity, a subsidiary principle of mentality, enables discernment and realization of the different qualities and properties of physical and mental phenomena.

Therefore, sanity enables psychophysical and psychosocial wellness. However, the nature of humanity permits both physiological and psychological deficiencies, defects, and illness. They may be caused by harmful, traumatic, and/or disruptive influences, conditions, or interactions (or a combination of causes).

For example, because of the interdependent interactivity of emotional and biochemical phenomena, sentient beings may suffer genetic and neurological changes that diminish their ability to discern the difference between realities and delusions (or illusions, hallucinations, imaginary phenomena, etc.). Of course, that limits or prevents appropriate mental, physical, and social responses to stimuli (events, changes, challenges, dangers, deceptions, etc.).

Mathematician and Nobel laureate John Forbes Nash, Jr., provided a historically tragic example. Though gifted with rare genius, Nash was also plagued by physiologically induced schizophrenia, hallucinations, and paranoid delusions. Sadly, his major contribution to the maths of game theory, the Prisoners' Dilemma scenario (PDS), was partly inspired by and based upon Nash's delusional paranoia. Then—partly due to the mass-trauma and insanities of World War 2 (and the Nuclear Age)—Nash's game theory inspired the Cold War strategy of "détente" and social control. Many years later, the schizoid fallacy of the PDS was realized and proven.

Yet, it still maintains the competition for military, industrial, and sociopolitical dominance (at any cost, including ecocide). So, the PDS proves Nash was right, at least about psychopathic leaders of military-industrial societies.

Clearly, both sanity and insanity cause realities of human being and civilization. However, sanity enables recognizing and understanding the goodness and benefits of psychophysical and cultural wellness. That enables recognizing and understanding the causes of wellness and its benefits, and what limits or degrades or prevents them. Being highly social primates, we naturally tend to favor wellness of mind, body, and culture.

Still, bad habits and corrupting influences can subvert our natural preference for optimum wellness. Thus, being such a mentally interactive species, our general quality of life is largely determined by the ratio of sanity to insanity maintained by our social norms, beliefs, habits, fears, hopes, and addictive tendencies. So, it is clearly good to understand and recognize the causes of mental and cultural wellness and illness.

Therefore, we should remember that there are 2 basic kinds of mental illness, **a**) neuro-genetic physiologically-induced dysfunctionalities, and **b**) culturally-induced normalized delusion, dysfunctionality, and neurolinguistic deficiencies. Unfortunately, the insanity of the dominant sociopolitical game and its socioeconomic system maintain all the conditions and biochemical factors causing more of both kinds of mental illness. So, clearly, eliminating all normalized delusions, erroneous beliefs, and deceptive rhetoric is now a critical necessity, especially in the domains of maths and science.

**Possibility:** Like reality and actuality, possibility is a metalogical principle that enables the presence and actualizable potentials of **a**) being, **b**) beings, **c**) non-illusory things, **d**) events, **e**) their properties, and **f**) processes that really function.

The principle of possibility is as necessary to actuality and reality as they are to being and sanity. However, naturally, possibility also enables the realities we call delusion, illusion, and imagination, among other potentials of being. Obviously, realities are possible and possibilities can be realities. Of course, to us, impossibilities may seem to be potentially real, but never become actual realities of being.

So, understanding the difference between possibility, potential, and impossibility enables good science, maths, valid proof, and optimum explanation of realities.

**Reciprocity:** Reciprocity is a functional principle inherent in all phenomena, however subtle or metaphysical. In principle, the universe can be seen as the relationship of all relationships, requiring reciprocity for its existence. Yet, actual reciprocity requires energy or its essence, activity, the principle.

Therefore, the reciprocity of relativity and identity, and of physicality and mentality (the principles) enable our understanding of reciprocity and its expressions. Clearly, intellect would be impossible without the reciprocity of perception and cognition, enabling and enabled by reciprocal awareness and appearance.

All relationships, whether elemental, biological or mathematical would be impossible without reciprocity. The principles of unity, primality, duality, relativity, symmetry, integrity, activity, and functionality enable reciprocity and everything else. So, all things are subject to the functional principle of interdependent interactivity because of relativity and primal (original) reciprocity. From the level of basic metalogic and elemental physical phenomena to the

astrophysical and psychosocial fields of being, reciprocity ensures that the constancy of interdependent interaction sustains the evolutionary creativity and reciprocal potential of universal being and its nature.

Thus, the properties and usefulness of mathematical reciprocals are no accidental invention of mathematicians. The reciprocal relationships of the reciprocals to their denominators—and of the sequences and patterns of all the primal and nonprimal numbers in the serial progression of the natural whole numbers—are enabled and sustained by relativity and integrity (etc.). Hence, original reciprocity and duality are inherent to all mathematical progressions and functions, shown by all sums and zeros of Riemann's Zeta function and formula ( $\mathfrak{R}_\zeta$ ) and by the enabling reciprocity of  $1/2$  and  $-2$ .

That is true because, implicitly and explicitly, all numbers, complex terms, polynomial expressions, algebraic equations, geometrical relations, and trigonometric functions require reciprocity. So, reciprocity, the principle, is integral to the holonomic metatheory of post-modern maths.

**Falsifiability:** Viable valid scientific theory must not only be verifiable but also falsifiable, because the nature of universal being is transfinite. Everything constantly changes, except for principles. So, being beyond knowing completely, actual, and virtual phenomena may be recognized and understood, but not fully described. Thus, to be congruent with reality and reflect the natural actualities discovered by new and/or better observations, good theory must be evolutionary, upgradable, and refutable, thus falsifiable.

Unfortunately, most pop-stars of modern maths, metamaths, cosmology, QM physics, and astronomy ignore their rejection of falsifiability and refutability. That prevents progress and resolution of the SM's current crisis. So, natural phenomena now challenge cherished SM assumptions, misconceptions, and misinterpretations. So, observed phenomena and data keep disproving the basics of current standard model theory.

Yet, SM believers do all they can to protect and preserve the incomplete foundation of existing theory (with ever more excuses and wilder speculations). Clearly, refusing to recall the necessity and importance of falsifiability and refutability of valid scientific theory is a self-deluding abuse of science. Of course, perpetuating confusion about the basics helps perpetuate enjoyment of wrangling over theorems, hypotheses, and conjectures that lack and/or prevent optimal verifiability, certainty, explainability, validity and/or completely logical provability.

Although valid tautologies and metatheorems congruent with principles of natural reality are not falsifiable, proving them and using them to prove theorems of subordinate logical systems makes falsifiability an essential element of metamaths. Falsifiability is thus a critical element of post-modern metamaths and holonomic proof theory.

**Definability:** Einstein realized that the best understanding enables the best theory, the best proof, and the best explanation. They all require and enable the best definitions of terms that, ideally, they represent valid concepts and actual phenomena. Thus, definability, the principle, enables the best theorems, metatheorems, proofs, and proof theory.

For example, post-modern metamaths enables and is enabled by necessary and sufficient definitions of terms. They enable description and optimal explanation of elemental principles that enable maths and universal reality, the actualities of being. Hence, post-modern metamaths is able to correct the deficiencies that caused the failures of the pioneers of modern metamaths.

Those deficiencies were caused by inadequate definability of the pioneers' terms, axioms, theorems, and metatheory. So, completing the pioneers' programs was impossible.

Lack of definability was clearly due to insufficient recognition and understanding of elemental principles, making the necessary foundation of metatheory an impossibility. Clearly, without optimum definability, sufficient explainability of metatheory and proof theory are impossible. Including the definitions of the enabling principles of maths and reality lets holonomic metamaths restore and fulfill the original purpose of maths: the development, study, discussion, knowledge, and understanding of universal reality, valid theory, and proof (for satisfactory certainty). Hence, holonomic metamaths enables better maths and science. (see defs., Falsifiability & Regularity)

**Certainty:** Mainstream SM QM 'cosmology' and Zermelo-Fraenkel set theory (ZFT) prevent arguments in favor of proof theoretic rules requiring satisfactory certainty of results (concepts and provable theorems congruent with reality).

Satisfactory certainty is the result of optimum proof and sufficient explainability. Thus, this revised metatheory of maths, proof, etc., includes certainty as a fundamentally essential element of optimal proof and metatheory. Recall that we appreciate science and good theory because it provides satisfaction with certainty, ensuring that new knowledge is valid or, at least, that new theorems are as viable as possible. Clearly, validity, value, and maths, its results, theorems, and metatheory depend on reliable certainties.

Certainty is enabled by and confirms awareness, mentality and, sometimes, validity. Of course, certainty may be an illusion or delusion. Hence, valid certainty is a prime motive and goal of science, maths, and proof. So, certainty requires actual congruency, the fact, making congruency indispensable for certainty. So, both are key necessities for the logical integrity of metamath, maths, and proofs in accord with reality.

**Explainability:** Inherently, good explainability indicates validity or adequacy and reliability; and it can support satisfactory results, certainty, and acceptability. It also tends to prevent or minimize objections, doubts, disputes, and disproof.

So, teachings, theorems, and assumptions that lack optimal explainability may lack value and necessary sufficiency, proportional to lack of validity or viability. In the fields of education, logic, maths, metamaths, engineering and other technical disciplines, any deficiency of theory or metatheory that hinders optimal explainability is unsatisfactory, and dangerous.

Explainability is clearly a key principle and element of the metatheory of science, maths, logic, and proof. It is therefore indispensable to good science and any theoretical work of real value and importance.

**Provability:** Provability is a principle and a necessity of good science (and maths). Good theory is a description of phenomena or enabling processes (or a definition of concepts and claims) that can be tested, verified (proven), and explained for generally satisfactory certainty of truth, being congruent with reality, nature, and/or logic.

Therefore, realizing that a theorem or hypothesis is or is not provable is critically important (to avoid retarding or preventing progress)

An unprovable set of statements or axioms fails to provide any certainty of validity, hence failing to qualify as a viable theory of science (or maths). Even in the domains of metatheory,

where logical tautologies are valid—to be considered well-defined, acceptable, and viably explainable—the elements of a metatheorem must be congruent with natural reality or, at the least, perfectly logical.

So, unfortunately, its ever-growing deficiency of provability and the increasingly vast number of disproofs (AKA anomalies) makes SM ‘cosmology’ a perfect example of why proof and provability are essential for good theory and science.

**Acceptability:** Acceptability is a fundamental principle of maths, metamaths, physics, valid theories, and definitive proofs. It should be considered essential for effective teaching and communicating valid information.

Unfortunately, acceptability can also seem to be an option, a variable quality of something that may lack validity or real value. So, some accept baseless opinion, erroneous assumptions, and lies because of deluded ignorance, irrational habit, or whatever. So, that kind of acceptability can and does cause or foster general acceptance of deficient or defective theory, bad science, and worse.

So, for science and proofs, acceptability must only be conceded when proven by validity, certainty, sufficiency, natural congruency, and optimal explainability.

**Disputability:** Disputability, the fact or condition, is normally caused by a) lack of validity or certainty, b) deficient explainability, or c) faulty logic, d) doubt or ignorance. The principle disputability is an important element of holotropic metamaths, logical analysis, and proof theory. (see def., below) Even using common logic can enable and require disputability.

Clearly, mentality, intellect, sanity, reason, and truth enable insight or intuition and knowledge that support agreement and/or acceptance of the validity or realism and adequacy of an assumption or claim. Alternately, knowledge and reason or intuition may cause doubt or suspicion, or curiosity that supports the disputability of a questionable assumption or claim.

So, despite their many benefits, the various versions of modern metamaths, especially Hilbertian formalisms, and the many questionable assumptions and claims in the complex of debates on the Quine-Putnam [Indispensability Thesis](#) are all perfect examples of theory and metatheory infested with inadequacies, thus disputability. Hence, optimal explainability and viability are lacking. That justifies intuition or suspicion that necessary validity and logic (sufficient for unconditional proof) are absent.

Another example: This project enabled proof that SM number theory suffers disputability because of inadequate numeric metatheory, insufficient logic and, thus, deficient explainability.

**Intelligence:** Essentially, intelligence is a mode of agency. The nature of being (its intrinsic enabling principles, properties, qualities, and potentials) enabled and sustains life and, therefore, its expressions and modes of agency, sentient awareness, and cognition. So, however primitive or seemingly simple, all beings and forms of being exhibit natural intelligence, at least as an enabling property or potential.

For example, healthy cells, mitochondria, and RNA exhibit primitive yet intentional agency, effective responsiveness, and purposeful behaviors (triadic coding, decoding, protecting, etc.). It seems only a passive database, yet DNA’s elemental morpho-structural logic embodies and expresses tetradic bio-semiotic code. Of course, we have no reason to doubt that DNA-RNA intelligence, agency, and semiosis are limited only to biochemical coding. Their molecular

structures can be thought of as somewhat like resonant bio-luminescent transponders or antennae, receiving and transmitting information at many EM frequencies (at near light-speed).

Clearly, that begs a big question. Where is the separation or difference (if any) between the intelligent agency of DNA-RNA (and life) and ours? The best answer seems to be that that is the wrong question. Life's elemental subcellular intelligence and human being are inseparable. The main difference seems to be that ego's socialization can enable stupidity.

So, stupidity is the opposite of wisdom, not of intelligence. Wisdom is the realization of the potential of life's intelligence. Subversive social programming and biochemical emotional conditioning can limit and pervert our intelligence, agency, and wisdom. Fortunately, being seems to favor wisdom (and eliminate excess stupidity).

**Awareness:** Necessarily, awareness, is the essential expression of mentality, the principle. Primal principles of being make the presence of awareness integral and universally pervasive. For example, without awareness, perceptions, appearance, knowledge, and information would be impossible.

Awareness enables intelligence, understanding, and intentional response, however simple. Understanding the basis of awareness enables us to understand the nature of perception, consciousness, intellect, and reality. We may then understand the depths and results of science, maths, logic, and intelligence.

Awareness is the primordial essence of intelligence and perceptive cognition that enable consciousness. Understanding awareness and the primal logic of mentality permits realization of the interdependently nondual nature of subjective perception, cognition, and objects of consciousness. That understanding enables realization of the psychophysical nature of our self-world constructs. Understanding that permits awareness of the inseparability of fundamental principles and the phenomena they enable, empower, and sustain. (re: def., Intelligence)

**Consciousness:** Understanding the nature of consciousness is a necessity for fully understanding physics, relativity, QM, and reality. Without a valid, viable, generally satisfying definition and explanation of consciousness, the anomalies, uncertainties, futile arguments, and deficiencies of modern physics and cosmology will keep limiting physics and society.

Now, despite contenders who play at defining and explaining consciousness (without any foundation of elemental enabling principles), we can admit that consciousness is a property of sentient being, enabled by the actualities and potentials of awareness and mentality, the principle. Naturally, awareness, sentient intelligence, knowledge, and consciousness are enabled by and express the nature of mentality, an intrinsic metalogical principle of being. Thinking that awareness, intelligence, consciousness, and thought are only products or expressions of physical or physiological functions and processes is simply foolishness.

Clearly, like physicality, mentality, identity, personality, intentionality, and the other natural principles enable a) mind and sentience, b) subjective consciousness, c) observation, and d) objects of conscious perception. So, awareness is the interactive essence and expression of mentality; and consciousness is the condition of sentient intelligence. It expresses the intrinsic metalogical principles and properties of mind and mentality.

So, the actual, nonphysical principles of being enable the physical and biological embodiments and/or expressions of consciousness. Reversing that metatheorem would imply the existence of an *a priori* but, as yet, undiscovered material or physical process that magically

produced living, perceiving, sentient beings, thoughts, and intentions. However, no magical mind-making substance nor physical objects or process ever was or will be found. Because the principles that enable all substances and minds are enabled by other metalogical principles, they determine their functions and potentials.

The nature of being, form, structure, functionality, interactivity, energy, and all its universal embodiments and expressions of reality ( $U_R$ ), enabled  $U_R$  and the nature of life, as is, long before planet Earth existed. Since then, because of their nature, the primal principles of  $U_R$  have never changed its nature. Being nonphysical, principles have nothing to change, and they never enabled anything else that could change them.

Physical conditions and processes cannot change nonphysical principles that enable matter, energy, processes, and transient conditions. Otherwise, there could be no finite forms, durable structures, characteristic properties and functions of life, identity, entities, things, and places. Yet, life and reliably durable elements are intrinsic to the field of being.

For example, science has discovered molecular evidence of life in the outer reaches of the heliosphere (this solar system), and far beyond. That strongly indicates the existence of biological life throughout the universe, as an intrinsic to being-as-a-whole. So, in even the most primitive forms of life—prions, virions, viroids, archeo-bacteria, and tardigrades—we see the basics of purposive intentionality (a subsidiary principle and property of mentality). In fact, the species of [microscopic] tardigrades can revert to a spore-like form that survives intense high-energy radiation outside Earth's atmosphere.

Hence, we can admit that a species of being with any awareness of the field (of being, and its '3D' dimensionality of local 'space') proves that even primitive expressions of intentionality demonstrate:

1. expressions/embodiments of mentality
2. forms/modes of subjective awareness, and
3. consciousness, however limited or unrecognizable

In our human case, we can understand apparently impossible mental phenomena as the evidence of our possibly limitless potential capabilities. In other words, the potentials of human mentality may be as limitless as the potentials of universal being, its mentality, creativity, energy, and power. After all, all properties, processes, and potentials are enabled and sustained by (and belong to) being, its universe, and its nature. So, for example, pre-mortem and post-mortem OBE's (out of body experiences) and accurate clairvoyance (visions and precognition of actual future events) can be understood as naturally generated potentials of consciousness, enabled by the intrinsic potentials and properties of energy, enabling meta-energy, universal intelligence, and mentality, the enabling integral principle of mind and identity.

Thus, we can accept that the intelligence and consciousness of mind and DNA can exist without, before, and after living brains and bodies. We can see that proven by research enabling progressive understanding of mental functioning by using EM sensors placed on (outside) the head. They detect patterns of EM field-effects caused by the brain's activity.

Yet, like  $\pm 96\%$  of the cosmic field (its hyper-luminal energy AKA 'dark' energy), we cannot directly detect the presence of the mind's field of meta-energy. Still, we can study the patterns of EM emanations and local field-effects of mind (awareness, consciousness, thinking, etc.), enabled by neural functioning, enabled by intrinsic metalogical principles and properties of mentality. Hence, we may come to understand the meanings of the patterns and the meta-



energy enabling the whole of being (the cosmos).

Thus, we should accept OBE and precognition as natural evidence of the pervasive intelligence of the field of being and its nature. They also prove that 'mind' is not only a 'physical' product of 'normal' biochemical, physiological functions (of a 'living' body), but an intrinsic potential of universal reality. So, we can be sure that the existence of consciousness is an inherent expression of the intrinsic potentials of mentality.

**Science:** Science is study, investigation, experimental and/or theoretical work. It is also testing and verification, performed for the sake of discovery and understanding. When other purposes are the prime motives, the work should be understood as and called either applied science or commercial science.

Before it was modernized, science was called natural philosophy. However, the prime motive for the new definitions (listed below) was prompted by realization that popular assumptions and misconceptions of and about science and nature have infiltrated nearly all domains of discourse.

For example, the Quine-Putnam indispensability thesis (QPIT) is important for the development of better metatheory of metamathematics and next-gen mathematics (maths). It relies on the assumption that maths is indispensable to science. Yet, the authors claim that we can rely on valid theories of science. If so, then, because we believe in current theories of science, we should also believe in the indispensability of mathematics (maths). However, like any other scientific theory, the QPIT is disputable and falsifiable.

Now, maths is a science and a semiotic system (a language). Therefore, it can also be a scientific toolset for doing technical work, or for proving or disproving any kind of theorem. For example, to disprove the QPIT we need only 1 example of science that does not depend on maths. For instance, philology is a science, an investigative discipline performed for the sake of discovery and understanding. So, we can use philology to test the QPIT.

Philology requires studies of language, culture, and history. However, maths may be part of a culture and its linguistic paradigm, but not necessarily required to do the research and new theory of philology. The best example though, from Riemann via Hilbert, is maths itself.

Consider this, instead of using many complicated mathematical operations and exotic symbology, Riemann preferred explaining "the ideas" required for a theorem or proof. Clearly, that may sometimes seem more difficult. Yet, any principles, phenomena, or processes we understand well enough can be proven and explained without using symbolic values (numbers) and the semiotics of maths. So, that falsifies the QPIT.

QED. Yet, ideally, mathematics is a logical language and a way of understanding realities. Thus, using ordinary language to study and describe mathematical realities is a valid use of the concepts, logic, and methods of mathematical thought and theory. So, obviously, both modern maths and currently popular science suffer from some inherent linguistic, theoretical, and logical deficiencies, paradoxes, and absurdities. Therefore, a prime aim and use of real science is discovering or recognizing and correcting current deficiencies, paradoxes, and absurdities that prevent or limit progress and better results. Trying to deny or ignore discoveries and better theory (to cover up or disguise or excuse) obsolete theory and inadequate results is anti-scientific.

**Anomalies:** Realities that exist despite the inherent deficiencies of a current theory and its

sociolinguistic paradigm (the conceptual context of current thinking and discussion about being, etc.) are called anomalies. Clearly, at best, theories are composed of ideas, beliefs, assumptions, facts, and truths represented by words, nomenclature (the names of observed phenomena only partially described by current theory).

Obviously, the whole duration of a natural phenomenon (and its ever-changing totality) can never be fully described by a theory, which is why all valid scientific theories are falsifiable. So, anomalies are landmarks, blind-spots, misconceptions, misperceptions, misinterpretations, and warning signs at boundaries. They limit a society's paradigm and its mental territory, its institutionalized worldview.

Anomalies reveal weaknesses, inadequacies, and fallacies built into languages, maths, and incomplete theories about being (and its nature). The exceptions to these truths are holonomic metatheorems based on understandings of the basic principles of being, or the whole basis of a logical system, such as a language or game, or maths, geometry, software, and so on.

**Axiology:** Axiology is the little-known, under-appreciated, and under-developed science of value and values. It may seem odd to include axiology in a paper on maths, ontology, and physics, but not doing so would be a mistake. In fact, not understanding the true nature of value helped subvert modern society, economics and, thus, also physics and maths (etc.).

For example, deficient axiology fostered and maintains chronic deficiency of ethical integrity and intellectual responsibility. Even the practice of axiology itself suffered from over-technicality and the pandemic penchant for valuing quantitative materialism and sciencey rhetoric (for more credibility?). So, it now fails to 'work' outside the social silos of a tiny minority of academics.

To foster a better, truly holistic, holonomic, and truly progressive evolution of science and maths, we need bio-ethical axiology. If we achieve that, as an essential element of macro-ontology and holontology (the science, theory, and holonomic metatheory of being-as-a-whole), next-gen science could a new era of STEM education (and global sanity). Of course, failing at that would permit more deficient evaluation and proportionally tragic results.

**Ontology:** Ontology was hijacked and subverted by medieval Western theologians and, most recently by sophists and technologists. It once was and still should be the scientific study of the realities and totality of being.

However, the ontology of modern, classical, and post-classical philosophy were as limited as the socially approved knowledge of the times. This era of civilization and science needs post-modern ontology. To be sustainably viable, it must consider and address the actual whole of being. It must also be as evolutionary as universal being, a holotrophic holontology (macro-ontology and meta-ontology) as if the whole of reality matters.

Naturally, being-as-a-whole is the only all-inclusive, all-encompassing reality (the universe, and its meta-energetic, metalogical nature). Therefore, all other sciences (and branches of philosophy) are subordinate subsidiaries of holontology. Of course, nobody can know everything about everything, but we can and should understand the nature of being.

**Phenomena:** A phenomenon (*pl. phenomena*) may be physical and/or only virtual. It can be a thing, being, or event. It may exist in/as a form, an object, a process, an event as a group or set. So, principles, concepts, and other nonphysical entities are actual virtual phenomena.

For example, universal presence (of being) expresses and embodies itself as phenomena. They are enabled and characterized by their innate principles and properties that determine their nature and potentials. Each apparent expression of being is a distinct yet ever-changing form of presence. So, although properties of transient phenomena and conditions may change, the nonphysical phenomena we can call intrinsic enabling principles remain reliably constant.

The relativity and interdependence of principles and forms of being enforce the interdependent relativity of all phenomena. Whether virtual or overt, the individual identity or entityhood of a phenomenon is a subsidiary aspect or element of the wholeness of being. So, a sentient being's perceptions are always of a psychophysical phenomenon or phenomena, yet not all phenomena are simply perceptual.

Theoretically, the existence of the universe and other phenomena (events, etc.) require no perception, nor individual perceivers. Yet, phenomena are compound results of dependent origination and transformative interaction. However, the intrinsic metalogical principles of nature are exceptional, essentially atemporal attributes of being (as a whole). So, being neither transient nor separate from the universal nature of being, its metalogical enabling principles enable the presence and awareness of phenomena, mentality, and minds.

**Field:** The term, though generally confusing, can be useful, as long as we recall that it relates to a fuzzy analogy for a property of being. So, "field" can refer to mental constructs and objects of maths, theoretical physics, and plasma physics. The field of energy some call "the vacuum" (or 'space') has magneto-dielectric properties. We can be sure of that because most of them were discovered, measured, tested, and described more than 100 years ago.

For example, the intrinsic principles enabling the field and its field-effects give it some properties of conduction, resistance/insulation, impedance, permittivity, potential (energy), and other qualities common to materials required for electro-magnetic phenomena. Yet, nothing lacks existence and properties. So, clearly, the field's magneto-dielectric nature and properties prove it something other than nothingness. However, a field of wild grass may be more like an interface between subfields of the cosmic field  $\{MDE^\infty, E_{EM}\}$  — of magneto-dielectric and elemental-material energy — than the SM models or an EM 'field' of a magnet moving in Earth's EM field. It may be an accident of sociolinguistic limitation and deficient epistemics that "field" was chosen to label what may as well be seen as a vast sky-ocean of energy. Yet, confusion also seems to come from being somewhat like fish or birds, who never see the medium in which they live and move. However, as long as we bear in mind that the term (field) is an arbitrary label (not what it labels), it will not confuse us.

For example, science proved that energy gives form, structure, and functionality to everything — to us, and to everything within and around us. Consider the solidity of ice and the ocean's fluidity, and the supra-fluid form and functionality of high-temperature steam — the energy, hyper-energy, and meta-energy of the universal field of being enables and sustains those forms and modes of energy. It does so without isolated subatomic points of magic and maths because of the meta-physicality, hyper-liquidity, and meta-gaseous hyper-plasma that fills  $\pm 96\%$  of its quasi-spheroidal vastness. In other words — like Earth's ocean and sky, the sun's sky, and the galaxy's local sky and beyond — the universe is a unified supra-fluidic field, enabled and sustained by its intrinsic metalogical principles.

Coincidentally (yet not accidentally), we can see the actuality of the above in the forms of cloud-like nebulae and the many forms of vortical field-flow above and below galactic cyclones

of plasma and stars (etc.). The temperature, solar weather, and radiant flow we see at the interface we call the sun's photosphere and corona give us actual evidence. The corona is nearly 5 times hotter than the 'surface' because the extra-solar pressure gradient enables that much more activity (vibratory interaction), radiance, luminous and ultra-luminous emanation, and bidirectional flow events.

In fact, the colossal fluidic (ionic) 'mass' ejections and streams of plasma (magneto-dielectric double-vortices, etc.) keep accelerating as they speed away from the sun, towards the 'local' planetary subfields, to the fringe of the "heliosphere" (the solar sub-field) and beyond. Regardless, SM QM cosmology makes the reality impossible, because

1. G (gravity) rules SM astrophysics, and
2. empty SM 'space' cannot support electricity, and
3. a SM sun only creates magnetism, not electricity, and
4. SM cosmologists ignore the inseparability of EM events, and
5. they refuse to revise their SM beliefs, assumptions, theorems, etc.

Yet, in spite of the mainstream SM QM cosmologists' belief system—and because of its very reliable enabling principles—the  $\{MDE^\infty, E_{EM}\}$  field and the sun keep doing what they do. Why and how? The further from the sun, the less turbulent interactions to slow the flow, and the more focused the EM driving force of the magneto-dielectric response (of the field).

Also recall the vast difference of magnitude and amplitude of the EM force ( $\pm 10^{39}$  times greater) compared to G (the gravitational effect); also that the field's "Planck energy" density ( $D_{EP}$ ) is  $\pm 10^{113}$  greater than matter's  $D_E$  and, so, combined  $EM + E_{PH} = 10^{\pm 152} > G + m$  (at the least).

Yet, it seems reasonable to wonder about high-energy rays, ions, and electrons. However, as explained above, we see what may look like spheroidal particles of light because atoms and other super-/ultra-/hyper-miniature plasmoids have photospheres, coronas, somewhat like those of stellar plasmoids. Yet, those are field-effects caused by local activity and densities of resonant pressure gradients, interactive flows, turbulence, and luminous interference patterns. So, we can think of such phenomena as being somewhat like omni-dimensional, animatronic holograms, projected from each vector of emergent force (within their elemental spheroids and vortices), energy, and hyper-energy.

Where does all the field's vast energy and power come from? It comes from everywhere and beyond (the meta-energy mode of the field and its hyperactive potency). In other words, energy, force, and power are expressions of the intrinsic metalogical principles that enable and determine the properties, forms, functions, and potentials of the field, its subfields, and field-effects at all scales. So, we can now understand the realities enabling thermonuclear fission, explosions, implosions, and fusion as results of either **a**) disruptive, disintegrative destabilization of internal and external flow regimes, and/or **b**) as results of naturally occurring plasma flow and super-compression.

Yes, resonant vibratory modalities and pressure gradients normally sustain the characteristic forms, structures, functions, and interactivities of the elements, in their native 'rest' states. For example, the more reactive or massive and complex the form, structure, internal functions, modes of flow, vibration, and interactions of an element's nuclear ensemble (of plasmoid nucleons), the less it can resist disruptive field effects.

Thus—relative to hydrogen or its 'free' ionic-protonic plasmoid core—the core ensemble of

uranium or a transuranic element is constantly being pressured (from within and without) to disintegrate. So, the 'radioactive' (dissipative) emanations of 'unstable' elements and isotopic forms of energetic matter can be thought of as like high-energy effervescence.

Remember, the core energy-density of the intrinsic-neutronic hyper-plasma vortices of elemental ensembles (of nuclear vortices) is  $\pm 10^{113}$  greater than the extrinsic energy-density of elemental matter; and its EM force is  $\pm 10^{39}$  greater than G field-effects (due to omni-directional fluid mechanics and hydrodynamics). Also, recall that all phenomena are enabled and caused by intrinsic principles sustaining the 3 basic modes of the energetic field: 'ordinary' energy & matter and the 2 regimes of hyper-energy (and by their interactions).

For example, when it 'escapes' or is forced out of a complex element, a neutronic vorticle (plasmoid) lasts about 14 seconds and, [allegedly](#), emits an 'electron' and a tasty yet virtually 'massless' anti-neutrino (instead of an anti-electronic positron). Then, allegedly, the previously neutral 'nucleon' seems to turn into a protonic vorticle (a hydrogen ion). Despite all the virtual realities, assumption, and confusion, SM QM and QCD also require other causeless and as yet unexplainable hypotheses, causing the infamous QM "neutron decay puzzle" (the NDS anomaly). Now, per post-modern ontology, the neutronic 'dark' stuff mystery (NDSM) is also obsolete.

However, using existing facts and methods of fluid mechanics, hydrodynamics, and upgraded (Prigoginean) thermo-dynamics\* we can easily understand what really happens when a 'neutral' magneto-dielectric double-vorticle is 'pinched-off' and ejected from a protonic vorticle (nucleon) ensemble as a hyper-plasmoid explosion artifact.

Clearly, that happens when a disruptive field effect (process or event) causes a disintegrative perturbation, a disruptively turbulent, disorderly destabilization and change of internal configuration, pattern of flow, and interaction. The basic form and functionality of an elemental phenomenon (of the local field) may be sustained yet transformed. In other words, the balance of the magneto-dielectric forces of the contra-rotatory flows of an elemental vorticle's internal plasma and hyper-plasma vortices may be altered without changing its characteristic atomic form.

How and why must that be true? Recall that the nature of being requires and sustains simplicity, integrity, regularity, and reliability. Those essential metalogical principles enable and sustain form, structure, function, energy, and generative interaction.

In other words, nucleonic cores of complex elements are like whirling, writhing, yet very orderly toroids or spheroids of sex-crazed snakes (made of hyper-fluid bi-directional vortices). So, an M Theory fix of String Theory is as unnecessary as the equally over-complicated, unexplanatory QED, SED, and QCD (and all the ridiculous excuses and anomalies they cause and require). The orderly, habitual configurations and relations of the elements – and their characteristic knots of internal double-vortices of energy and hyper-energy – are caused and sustained by the enabling field modalities, resonant harmonics, subharmonics, pressure gradients, characteristic interactions, forces, turbulent regimes, and sustaining effects of the enabling metalogical principles of being.

The foregoing facts, theorems, and metatheorems also help explain the phenomena that adherents of QM, QED, and QCD misperceive, misunderstand, and misinterpret as fractional spin and partial charge phenomena. For instance, motion is motion. There is no half motion, nor any fractional spin. A thing either moves or spins, or it does not. Misusing the word "spin" is a symptom of the linguistic problem. Understanding the realities of elemental energy phenomena

is easy when we eliminate the confusing SM rhetoric and shibboleths.

For example, ordinary hydrodynamics and fluid mechanics help us understand nature's many kinds of interactive flow, laminar flow, pressure gradients, turbulent regimes, and vortical transport events—like hurricanes, tornados, lightning, electronic flow, and elemental vortical flow. Those forms and modes of energy transport are enabled by principles that enable and sustain all fluidic, super-fluid, and hyper-fluid phenomena.

The most physical proof of that theorem is the super-fluidic modes of helium-3 ( $^3\text{He}$ ) and helium-4 ( $^4\text{He}$ ). For example, liquid  $^3\text{He}$  or  $^4\text{He}$  poured into a container—in a suitably cryogenic environment—cannot be contained in it, despite gravity. In other words, superfluid  $^3\text{He}$  and  $^4\text{He}$  defy the 'law of gravity' and most of the SM physics belief system. They can and do spread themselves as thin as possible over a suitable surface of another substance.

Why and how? The SM excuse is that, while their temperatures enable superfluidity,  $^3\text{He}$  and  $^4\text{He}$  escape the force of friction. Of course, saying that fails to explain how or why they do what they do. Nor does making up ever more exotic maths or graphs or new hypothetical sub-nucleonic particles help us understand anything more about the nature of  $^3\text{He}$  and  $^4\text{He}$ , or of nature itself.

However, like all other elemental forms and modes of energy, the nature and potentials of  $^3\text{He}$  and  $^4\text{He}$  are enabled and determined by and respond to the nature and forces of the local subfield in which they exist, the most powerful being EM forces. So, the magneto-dielectric nature, energy, and forces of local subfield regimes—not gravity—dominate the activity of  $^3\text{He}$  and  $^4\text{He}$ . So, we can deduce and infer the principles and modes of energetic interaction that cause the properties, potentials, and modes of superfluid  $^3\text{He}$  and  $^4\text{He}$  and all other fluidic events. Hence, using the logic and facts of hydrodynamics, fluid mechanics, and plasma physics we can relate interactions of superfluid  $^3\text{He}$  and  $^4\text{He}$  with their [cryogenic] local subfields (surfaces, planets, stars, galaxies, cosmic plasma currents, and local hyper-plasma flow events) to the causal, enabling principles and well-known  $MDE^\infty$  & EMF field-effects.

For example, we can deduce and infer superfluid  $^3\text{He}$  and  $^4\text{He}$  activities by relating them to the interactions of the regimes of the  $MDE^\infty$  revealed by cryogenic electro-magnetic storage toroids (EMST) and ordinary magnets.

First, though its liquid helium cooling medium may not be superfluid, the whole inner subfield of an EMST is super-conducting because the flow of energy it sustains is hyper-fluid. So, when its local  $MDE^\infty$  subfield's condition is optimum, there is nearly 0 (zero) counter-acting resistance to flow (of energy), nor significant losses (dissipation of energy). In fact, sub-microscopic images taken at the interfacial boundary layer of the cryogenic and noncryogenic domains (the inside & outside) of EMSTs reveal nano-tornados (of bidirectional energy flow) forming, writhing, and ceasing, repeatedly. That enables 'recharging' of the EMSTs 'inner'  $MDE^\infty$  subfield (of luminal electronic plasma and hyper-luminal hyper-plasma). Like all tornadic/cyclonic events, nano-tornados are concentric double dual-vortices of  $MDE^\infty$  flow. Thus, their writhing axial core, though looking empty, is a hyper-luminal dual-vortex of hyper-plasma flow.

Now—far beyond what SM theory can explain—this view of a cryogenic EMST's activity is also supported by the seemingly strange magnitude and super-extension of its 'magnetic' field (*i.e.*, its local  $MDE^\infty$  subfield). This approach also lets us understand and explain how and why its local  $MDE^\infty$  subfield extends so far beyond SM explainability.

However, we must always bear in mind that the best theory requires and enables the best

understanding and explanation. Describing fractions of reality does not equal explanation. Yet, despite the lack of adequate explanation, why do fans of SM QM cosmology ignore thousands of logical, astronomical, and elemental disproofs? The most logical answer is that pop SM SMEs are either embarrassed or too intellectually (and ethically) dishonest or irresponsible, or else, possibly, simply confused or emotionally immature.

Proof of those possibilities is confirmed by this metalogical explanation of the enabling principles and processes that allow superfluid helium to flow 'up' the walls of containers (away from planetary 'centers of gravity'), despite gravitational side-effects of local subfields ( $\mathbf{g}_{fe}$ ).

So, superfluid helium and other 'matter' at or very near 0° K (the "Z point" interface) are nearly perfectly resonant with the hyper-frequencies of the field of being, its ground/rest-state. So, superfluid helium always seeks the way of least resistance to its state of least turbulence, least stress, for greatest laminar flow and/or harmonic resonance (in contact) with local  $MDE^\infty$  (elemental E, plasma, hyper-plasma) subfield. As mentioned above, this explanation is also supported by the observable, well-known realities of magnets, including each atomic magnetic subdomain of a magnetized substance.

Remember,  $\mathbf{g}_{fe}$  (of the field & subfields) is less than  $10^{-39}$  as potent as the EM force (EMF) of the  $MDE_{f\infty}$  (field & subfields). So, the EMF of every magnetized elemental vorticle (proton, or atom) and every piece of magnetic metal is  $\pm 10^{39}$  times stronger than the  $\mathbf{g}_{fe}$  of the local  $MDE$  subfield (enabling it). That causes and enables the "work" (the power, force, interactions) and the results produced by magnets and their 'fields' (of energy), seemingly without any visible motion, motive, external power source, or generator. Of course, that's obviously an illusion caused by limited consciousness (deficient knowledge). Every magnet is a  $MDE$  field-effect caused by all the forms and modes of energetic flow, vorticity, rotation, vibration, and interacting emanations enabled and sustained by the luminal and hyper-luminal  $MDE_{f\infty}$  regimes of the cosmos (the field of being). In other words, obviously, magnets and their flow of energy are enabled and sustained by the whole field of being and its nature (activity, integrity, unity, and its other enabling metalogical principles).

So, in the absence of turbulent, noncryogenic perturbations, superfluid helium can only respond to the elemental flow trends of 'containers' and cryogenic environments per the intrinsic enabling principles. Thus, superfluid  $^3\text{He}$  and  $^4\text{He}$  resonate with and 'spread' out in the laminar interface of the local energy density/pressure gradient (the 'ground-state') at adjacent surfaces. In other words, the magneto-dielectric interactions of superfluid helium (with its local energy domain) and quasi-gravitic effects of intimate proximity with other cryogenic substances (due to locality, etc.) enable super-energetic flow. Thus, regardless of the exact level of energy density of a cryogenic plane/surface, super-conducting superfluids ( $^3\text{He}$  and  $^4\text{He}$ ) will reach their limit of elemental cohesion and viscosity. The intrinsic integrity of form, structure, functionality, and the subsidiary principles enabling them support those facts.

That proves and helps explain the metatheory of meta-energy, hyper-energy, and ordinary energy phenomena (sustaining the transfinite metalogical principles of being and its nature). Still, we can ask why the nature and interactivity of superfluid helium are not the same as other isotopes of He, or of H (or  $\text{O}_2$ ). We can then verify the validity of macro-ontology by reviewing and analyzing the natures, forms, structures, functions, and interactions of those critically important elements of physical phenomena. First, literally, Hydrogen (H) is the prototypical elemental form of ordinary matter. Now, recall that plasma accounts for nearly 96% of the field's luminal and subluminal matter; and most of the cosmic plasma is hydrogenic.

Why? The protonic core of H is the basic vortical component of all the more complex elemental plasmoids (atoms). Being the simplest, smallest, and least massive elemental vorticle, H is the most responsive to vibratory field-effects. Now, remember, energy is activity or potential, proto-energy. Yet, the harmonic resonance of H in its native frequency, pressure, and flow regimes makes it one of the most stable expressions of elemental energy, along with its stable plasmoid ensembles ( $^3\text{He}$ ,  $^4\text{He}$ , and the other “noble” gas elements). In fact, the nature of proton, H, is what enables the other stable elemental ensembles (atoms).

Now, also bear in mind that mass is simply a measure of the energy entrained in and semi-contained when sustaining a form of matter (see def.). So, remember that mass is not matter. Still, like other low-mass, normally extraterrestrial gases, at moderate temperatures and relatively low pressures, H is gaseous (molecular ensembles of  $\text{H}_2$ ). At very-low temperatures and high pressures H is liquid, and at ultra-high pressures a solid, super-conductive metal. So, if the SM prediction of a superconducting, solid, metallic hydrogen sphere in planet Jupiter were correct, it could cause a colossal magnetic field. Yet, there are many more massy elements in Jupiter’s subfield of energy, that should be nested very much deeper than hydrogen.

Indeed, the next deeper layer of Jupiter’s ultra-dense ground-state would be made of helium, somewhat pudding-like, getting more metallic or ice-like with depth. After all, though the existing ratios fail to comply with SM QM ‘cosmology’ predictions, helium seems to be the second most abundant element in the cosmos. But, why not? Helium isotopes are really complex ensembles of protonic and semi-neutronic hydrogen. Yet, clearly, their basic structural properties and potentials—not SM rules of pointiness—make hydrogen and helium (and their qualities, properties, and potentials) what they are. The electrons are really like electronic weather events, somewhat like nanoscopic versions of Jupiter’s Red Spot and a bit like the persistent polar plasma currents of Saturn, the galaxy, and countless other subfields of the cosmos.

Here again, it helps to recall that the nature, normally stable integrity, simplicity, typical relational ensembles, and activities of H, its 2 isotopic forms, and  $\text{H}_2$  are expressions of pure energy: meta-energy, hyper-plasma, and luminal plasma; and [that] all forms of energy are enabled by intrinsic, nonphysical metalogical principles (of being and its nature). Also, without pre-existing enabling principles, processes, and powers, hypothetical (or undetectable) ‘massless’ particles of QM maths, equations, and hyper-complicated SM beliefs about an accidental space-time, inflatons, god particles, magic strings, spinors, twistors, mathematical dimensions of geometric space, and other unnecessary artifacts of SM quasi-science are unable to cause any physical elements, processes, and events, like the cosmos and particles.

Granted, modern QM and EU theorists got some things right, approximately. However, maps and models are not the territory, and maths’ approximations are not precise measurements, nor completely accurate descriptions. So, we can take Einstein’s advice. We can and should make it all as simple as possible, but not too simplistic.

For example, we can keep the technical methods that work in good accord with actual energetic phenomena. Yet, we can forget the most nonsensical and torturously over-complicated hypotheses, absurd theorems, bizarre assumptions, and pop-sci shibboleths of SM QM cosmology and neo-mythic dogma.

What does that mean? It means we can use vectors, even vector spaces, scalars, maths for hydrodynamics, fluid mechanics, plasma science, astronomy, and macro-ontology. That will enable a truly holotropic, evolutionary theory and metatheory of universal being, its enabling



metalogical principles, and energy. It also means that we can drop all the confusing misuse of terms, concepts, and definitions that propagate ever more unexpected anomalies and baffling mysteries of SM pseudo-cosmology that seem to make SM QM a lame excuse for believing in an accident of atheistic creation of the field's infinite totality from a tiny point of nothingness at the center of nowhere.

**Energy:** Very few modern theorists achieved Michael Faraday's understanding of the magneto-dielectric nature of energy. Des Cartes and Newton never came close. So, their followers and successors were led astray.

Now, we know that magneto-dielectricity ( $MDE^\infty$ ) and its electromagnetic forces (EMF and/or  $F_{EM}$ ) are more than  $\pm 10^{39}$  times stronger than G (AKA **g**), the 'force of gravity' (a by-product and field-effect of energy, hyper-energy, and meta-energy). In fact, some bright QM 'physicists' found that magneto-dielectric hyper-energy (at  $0^\circ$  K, zero-point,  $E_{Zp}$ ) is  $\pm 10^{113}$  greater than the energy density of massy (*i.e.*, lossy) elemental matter.

Yet, like matter, energy is an emanation and expression of the intrinsic principles of actuality, causality, potentiality, activity, motility, reciprocity, and magneto-dielectric relativity. So, naturally, the enabling principles and properties of energy are enabled by the universal metalogical principles of being, form, structure, functionality, actuality, activity, causality, vitality, expressivity, permittivity, susceptibility, transmittivity, receptivity, potentiality, and potency (etc.).

From ancient times, observers with great awareness realized that the life force (our essential bio-energy and mental activity) are expressions of energy and power they called prana, la, chi, ki, or whatever. We can think of its highest level of activity as meta-energy. We can be sure of that because change and motion are modes of energy expressing the nature of activity, its essential enabling metalogical principle. For example, our thoughts and modes of mental activity change and cause effects and changes in our local field of being. Yet, mental/emotional activity is not only mediated by physiological, electrochemical interactions of our cells. Our local field of being and identity is pervaded by all the EM forces and magneto-dielectric field phenomena of being, including all the EM emanations of every cell, every mitochondrion [*sic*], every microbe, and every viroid/virion, every molecule (RNA-DNA, etc.), and every 'atom' of matter in and on and around our bodies are all emanating energy at their own characteristic intensities, frequencies, and modes of vibratory activity.

Of course, whether we notice it or not, each of those embodiments of being and their energetic field-effects are always changing, causing new changes in our personal psychophysical fields of being and experience. In other words, our minds and bodies are complex, nondual phenomena of the field of being and its energy, at every level and mode of interaction (from the 'subatomic' on up/out to the macrocosm) and intelligence. The primal properties of energy (its magneto-dielectric field effects and electromagnetic forces) are functionality, motility, fluidity, effectivity, relativity, reciprocity, interdependent interactivity, transmittivity, conductivity, permeability, resistivity, impedance, capacitance, inductance, permanence, multiphasic presence, transfinite duration, power, force, radiant emanation, pulsation, oscillation, vibratory motion, axial/vectorial vortical flow, and momentum.

Naturally, most of energy's properties are principles, enabled by other intrinsic principles, like directionality, locality, physicality, unity, duality, totality, and the other principles necessary for universal being and life. For example, all the principles and properties of energy

enable and animate living beings, even viroids, virions, and prions. So, composite beings live as long as their intrinsic energy level remains sufficiently above the minimum required. (see def. of Life)

A more microscopic example of the nature of energy can be seen at the laminar boundary layer of toroidal superconducting cryogenic storage coils. The nearly complete lack of counter-electrical resistivity enables almost perfectly unimpeded plasmonic flow of energy within and around the toroidal field of flow. However, the cryogenic environment is slightly less than perfect. So, tornado-like microscopic double-helical vortices arise, persist, and dissipate, intermittently in the transition layer boundary between the singular, toroidal flow of electronic fluid and the surrounding bath of super-fluid liquid helium.

Hence, the apparently empty core of the nanoscopic tornados forming and dissipating in the almost turbulence free transition layer are actually full of the pure hyper-energy/matter exchanged at and with the invisible  $\{MDE^\infty, E_{EMF}\}$  boundary. Those high-energy phenomena exhibit characteristics that help us understand the cryogenic and near-cryogenic, ultra- and hyper-high energy states of the extra-planetary domains of the cosmic  $\{MDE^\infty, E_{EMF}\}$  field.

In other words, the microcosmic vortices we see in the cryogenic domain of toroidal superconducting (energy storage) devices, demonstrate the same intrinsic principles that enable and govern the axial vortices at the center of galaxies, hurricanes, tornados, lightning, and the twisted-pair filaments that cause polar auroras and intergalactic currents of plasmas and hyper-plasma. So, we can see that the super-massive energy-density (mass) at the heart of a galaxy's axial, double-helical vortical flow is due to the radiant  $MDE$  field-effects,  $E_{em}$  forces, flow, and pressure gradients. Those are caused and sustained by all the energy of stars and plasma currents charging a galaxy's axial vortex or spheroidal core.

That theorem is supported by the universal fact that the furthest reaches of galaxy's spiral 'arms' (clouds & currents) of stars move at the same velocity (rate of rotation) as the inner-most boundary of the eye of the galactic hurricane. So, all the suns' positions relative to the galaxy's central quadruple-vortex (or core) remain relatively fixed. Thus, the core energy density can be calculated per...

$$\text{Eq. \#?}. E_{Gc} = n_s \sqrt{E_s(E_{EMF})} \cdot 10^{\pm 39} (\mathbf{g}^3 \mathbf{m}) v \pi r^4 \cong D_E \because$$

$$E_{Gc} \equiv E_{PH} = E_U^\infty \approx 10^{\pm 113} \pi^4 + 10^{\pm 39} = \pm 10^{\pm 152} > G$$

In other words, the energy density ( $D_E$ ) of the galactic core ( $E_{Gc}$ ) equals the number of local stars times the square root of the stars' radiant energy times the quantity of elemental energy phenomena times the scalar product of the EM force times gravity times the cube root of galactic mass, times its rotational velocity times pi times the 4<sup>th</sup> power of the radius.

That is so because all galactic subfields (of plasma, stars, etc.) spin as a single  $\{MDE^\infty, E_{EMF}\}$  phenomenon, energizing their axial cores (etc.). Thus, we have the approximate luminal energy density equal to  $10^{\pm 39} (\mathbf{g}^3 \mathbf{m}) v \pi r^4$  at a galaxy's core. However, bear in mind that spiral galaxies have quadruple laminar vortices, caused by their bidirectional double-helical vortical flow of hyper-plasma ( $E_{PH}$ ) within and around their 2 bidirectional double-helical vortices of  $\{MDE^\infty, E_{EMF}\}$  flow.

So, per QED & SED theory, since the relative energy density of  $E_{PH}$  is at least  $10^{\pm 113}$  times greater than that of 'normal'  $E_{em}$  density (and EM force is  $10^{\pm 39}$  greater than  $G$ ), the apparent mass and energy of the exact center of a galactic vortex is virtually infinite, equivalent to  $\mathbf{E}(\mathbf{m}) \approx$

$\mathbf{g} \bullet \pm 10^{\pm 152}$  (at the least).

That explains the apparent existence of a super-massive ‘object’ (without detectable luminal mode energy) at a galaxy’s core. Also, a galaxy’s local hyper-plasmonic field is moving with and within the galactic spin of luminal  $\{MDE^\infty, E_{EMF}\}$  phenomena, and vice versa. So, they are inseparably interdependent, interactive, modal domains of universal energy ( $E_U$ ) and universal being/actuality ( $U_A$ ).

That explains the existence and detection of ultra-colossal jets, colossal “bulbs” of ultra-high-energy gas, and plasmonic currents that emanate from the galactic core (somewhat like magneto-dielectric lines of force in a spinning semi-spheroidal field AKA a magnetosphere). Naturally, despite QM nonsense and ignorance, all magnetic and electrical flow phenomena are inseparably interdependent field-effects. Thus, as the intrinsic principles of being enable and sustain  $U_A$  (the cosmos), so does the pure energy that enables its field of magneto-dielectric and elemental energy phenomena,  $\{MDE^\infty, E_{EMF}\}$ , enabled and sustained by  $E_U$  (including the enabling meta-energy (and hyper-luminal hyper-plasmas).

Therefore, if there are any spheroidal ‘objects’ at the centers of galaxies, they must be ultra-colossal hyper-plasmoids caused by plasmonic pumping and the “pinch” process, not by gravitationally collapsed super-stars. That eliminates the excuse for reifying (thingifying) conceptual objects and artifacts of abstract maths and statistics. So, the inexplicably confusing singularities, like black holes (and big bangs of nothing before beingness began) are now unnecessary. (see defs., Particles, QM, and SM)

Still, we should remember that many galaxies move within galaxy clusters within super-clusters, and that they move within ultra-colossal currents of plasma. Some flow across more than half the diameter of the detectable field of universal energy. Obviously, like any other EM circuit, those currents begin at cathodic sources, and flow toward anodic terminals.

Clearly, those ultra-colossal currents and their contents are interactive effects of their surrounding hyper-luminal  $E_{PH}$  medium. Also, recall that the detectable region of being must be moving with the rotation of the whole field, but at a rate undetectable from within it. Yet, we can accept cosmic spin, hyper-viscosity, and turbulence as the source of energy released by field-effects (as ‘background’ microwaves, cosmic rays, galaxies, stars, plasmas, etc.). Hence, equation (#2?) is only good for finding approximate energy density of galactic cores (relative to the local subfield of a galaxy). To precisely calculate the absolute energy density of a galactic core requires including the velocity of the galaxy’s motion in or relative to the others in a cluster and, also, to the field external to the plasma current carrying them toward its terminus, and its actual velocity of spin around the cosmic axis of rotation.

So, clearly, we should acknowledge the energy and velocity of the plasmonic currents moving the galaxies, stars, nebulae, and the field. Ideally, if we could, the equation would include the actual energy (and velocity) of the field spinning around the universal axis, as

**Eq. #?.**  $E_{vr} = E_{PH} \equiv G + m \bullet \pm 10^{\pm 152}(E_{U^\infty})$

That final scalar dot product indicates immeasurably infinite universal energy ( $E_{U^\infty}$ ). After all, it is also infinitely generative and enabling, sustaining the totality of  $U_A$  (universal actuality) and its magneto-dielectric field of phenomena and meta-phenomena. Clearly, though meta-energy and nonphysical phenomena (principles, etc.) are not and cannot be directly sustained by luminal and hyper-luminal energy, they are as inseparably interdependent as the relativity of being and nonbeing (nonexistent nothingness).

Now, per SM notions, 'gravity' is acceleration. Thus, we can infer and partially deduce the relative energy of cosmic rotatory velocity, much the same way we can see, infer, and partially deduce the presence and activity of the galactic and intergalactic  $E_{PH}$  field (AKA 'dark' energy/matter). However, even if the James Webb Space Telescope shows us 10 or 20 times more of the  $E_{U^\infty}$  field (beyond the  $\pm 93$  billion LY diameter sphere of field-effects now detectable), unless it shows us the cosmic axis, we will have no measure of its size.

Also remember that real scientific method requires measurable and/or provable phenomena. Therefore, even if we get to see the cosmic axis, there is no guarantee that we will ever see its periphery, if there is one. Regardless, the nature and qualities of being and energy are much more interesting than quantities and absurdities. In fact, there is no way to disprove Buddha's theorem:

The cosmos and its worlds are dreams within a dream (of a primordially beginningless, thus endless and infinitely vast mind).

Still, the field of being expresses and embodies intrinsic metalogical principles enabling, empowering, and sustaining us and the rest of the cosmos. So, in principle, pure energy is the pure expression and essence of activity and interactivity, enabled by metalogical relativity, reciprocity, vitality, and the power of presence. So, as Einstein intuited, energy and matter are fundamental, interdependent enabling expressions of cosmic reality (actuality, form, structure, functionality, interaction, and presence).

So, instead of imagining a ridiculous 'continuum' of curvaceous yet nonphysical 'space-time', we can now see the hyper-luminal field of being as an ocean of hyper-fluid, enabled and sustained by integral, elemental, metalogical principles, energy, and power, enabling and enabled by being's meta-energy. Of course, they are expressions of the purest, subtlest form of energy, metalogical meta-energy. (see defs., Energy, Time, & Space)

Einstein also realized that there is a cosmic 'medium', like an actual or virtual gas, that enables energetic field-phenomena, such as transmission of emanations and emissions of energetic phenomena. However, he was confused in thinking that "time is motion." That defective over-simplification confuses too many of us.

How? Not only because time is a mental fiction, but also because Einstein failed to mention that motion is an expression of energy. He also failed to say what kind of medium enables it (energy, including hyper-energy & meta-energy). So, clearly, Einstein misunderstood motion, energy, and the field. He was also either confused about enabling principles or else simply ignored them. Sadly, his SM QM successors were equally confused, and/or worse.

A better way to think of the varied frequencies, flow regimes, and pressure gradients of the  $E_{U^\infty}$  field is by analogy with a) dense oceanic salt water, b) an upper-layer of fresh water, c) Earth's atmosphere, d) the Sun's heliosphere, and e) the interstellar & intergalactic regimes & regions of energy (E).

In that analogy, the ocean and less salty water symbolize the domains of 'slow' luminal and subluminal energy phenomena, where complex turbulent phenomena and interactions create the characteristic substances, elements, frequencies, flow regimes, and pressure gradients. The air of Earth's atmosphere is much less dense, less viscous, more active, more subject to turbulence but of lower-order pressure gradients. The energetic field of the heliosphere, beyond Earth's magnetosphere seems much less dense, more energetic, yet seemingly less turbulent.

The galactic interstellar and intergalactic regions seem much less dense, but with the much

more energetic luminal phenomena of the more harmonic super-high and ultra-high frequency regimes, seemingly, with much less turbulence per unit volume. However, as usual, analogies are imperfect and limited.

So, accurately thinking or talking about energy requires recalling that mass and energy density  $D_E$  are measures of results of interactivity, motility/vorticity, velocity, momentum, force, intensity, frequency (rates of vibration and/or pulsation), amplitude/potential, and dissipative radiation (net energy loss). Yet, those actualities exist because of and relative to the hyper-energy field (which absorbs seemingly 'lost' field energy in galactic vortices). To understand the nature and dynamics of the  $\{MDE^\infty, E_{EMF}\}$  field requires a new way of seeing its dualities, symmetries, and meta-symmetries within its nondual totality.

A simple 3-mode model of the  $MDE^\infty$  field's density gradients helps:

0.  $\pm 1/3$  of the hyper-mode is hyper-dense hyper-frequency  $E_{PH}$
1.  $\pm 2/3$  of the hyper-mode is ultra-dense hyper-frequency  $E_{PH}$ , and
2. the  $E_{EM}$  mode is luminal (plasma, RF, UHF, ultrasonic, sonic, subsonic, kinetic, etc.)

Naturally, the 3 regimes have corresponding harmonics and density/pressure gradients. However, if it were physical, we could say that the enabling meta-energy regime (of pure principles and other nonphysical phenomena) is another gradient. Yet, clearly, it is the integral enabling source of the  $\{MDE^\infty, E_{EMF}\}$  field and all subsidiary phenomena, including us, minds, science, logic, and mathematics. Also, from this perspective, relative to the hyper-plasmonic hyper-energy ( $E_H$ ) modes of the cosmos, all the elements we know as light or heavy (in the  $E_{EM}$  mode of matter) have inverse proportional energy density.

Thus, 'gravity' (G) is a by-product and side-effect of the  $E_H$  and  $D_E$  modes of the field; and, so, the more complex elements and seemingly heavier objects actually rise out of and away from the denser energy regimes. In other words, all less energetically dense objects are like bubbles that rise out of the ocean's depths. Exactly, how and why, requires more rethinking of energy.

For example, any kind of explosion in the  $E_{em}$  mode of being, requires sufficient pre-existing energy and a causal process. So, even if we say that the  $E_H$  of the  $MDE^\infty$  mode was a pre-existing field or source of hyper-plasmonic energy (regardless of its origin), still a causal process was required to get part of it to leak enough E to enable any kind of fuel, motion, ignition, fission, and explosion or implosion. However, we may as well say that every thing simply emerged and took form as the field spun, developed, and evolved.

The best candidates for the most primal, elemental, and macrocosmic forms and sources of energy are 1) a magneto-dielectric field, 2) dynamic flow, 3) spin, rotatory motion, 4) vortical motion, and 5) energetic interaction/reaction. Yet, 'early' in the imaginary Big Bang 'universe', initially, nothing interactive existed, then nothing reactive, then not enough of anything to make an explosion of everything out of nothing. So, unless we accept the intrinsic power and co-emergent potentials of natural metalogical principles and the  $\{MDE^\infty, E_{EMF}\}$  field of being, we get no spin, no energy, no turbulence, no luminal elemental phenomena, and no explosions, ever.

In this view, we can see original spin, energy, and power as causing pervasive microwave energy is because the universe is still spinning. We need no big bang 14 billion years ago to begin a spherical universe much larger than 14 billion light-years in diameter. No need to make up for a missing big bang with ridiculous notions about 'dark' energy & 'dark' matter.

Also, as both Nikola Tesla and the great astronomer Halton Aarp realized, accepting the

realities of spin and vortical flow can eliminate the embarrassing anomalies and problems associated with the illusion of cosmic expansion, etc. (caused by QM cosmologists, et al).

**Matter:** Naming the basic forms of matter (solid, liquid, gas, and plasma) is a very inadequate definition, especially for any post-modern era of science and ontology. For instance, naming those 4 modes of matter tells us nothing about the fundamentals of how and why matter is what it is. Likewise, labeling and describing observed properties of the energetic elements of matter leaves us equally unsatisfied.

For example, QM and SM physics considers the elements compound phenomena made of other compound phenomena, called particles, composed of an exotic zoo of other particles (composed mostly of 'empty space' and undefined energy, plus some spin), and other undefined, unexplained objects and probabilities of QM maths. They do not explain how or why any precursor particles and/or processes could suddenly exist (without cause), then cause other particles, elements, and their properties (without necessary principles, conditions, and processes).

SM SMEs only describe what their QM maths and models let them imagine and think about a tiny fraction of 1% of what exists. They also ignore or misperceive or deny the vast majority of actual realities and required principles outside their theoretical box of concepts, notions, conjectures, and hypotheses. So, post-modern physics and ontology need a new, holonomic definition of matter and energy, providing optimum explainability, good understandability, believability, reliability, and satisfaction.

Therefore, sufficient definition, necessary for optimal progress, requires starting with the basics. Instead of speculating about 'dark' matter and causeless particles (with magic powers that came from nowhere before anything existed), we can consider the nature, essence, and potentials of the intrinsic principles that enable matter, energy, and all other phenomena, including the universe itself.

For example, the prime principle enabling solid matter is solidity, a principle of form, a metalogical principle. The prime principle enabling liquid is liquidity, a principle of form, structure, and functionality. Liquidity and fluidity are also enabled by activity and motility, all enabled by functionality (the enabling metalogical principle). Gaseous matter is also enabled by activity, motility, and fluidity, principles enabled the primal metalogic of functionality, structure, and form.

The prime principles enabling and expressed by electronic and ionic plasmas are duality, activity, vorticity, fluidity, motility, reciprocity, and magneto-dielectric relativity. They express enabling metalogical principles of being, form, structure, function, and energy. Thus, we can define 'anti-matter' (positrons, etc.) as contra-rotatory, reciprocal, magneto-dielectric complements of oppositely charged plasmoids ('free' protons, etc.), vorticles, not particles.

Yet, the fact that so little matter exists can be understood as evidence that principles, energy, and hyper-luminal hyper-plasma are the sufficient necessities of universal being.

Naturally, without all the intrinsic principles enabling being and energy, they could not exist, nor would we. Nor could there be any galactic and intergalactic interaction with what SM SMEs call 'dark matter' and 'dark energy' — without intrinsic enabling principles of the cosmos and its nature. In fact, obviously, the nature of universal being is its enabling, governing principles, which enable nature's ways, modes, and processes.

Hence, we can understand, define, and explain matter as macrocosmic and microcosmic

field-effects, phenomena embodying and/or expressing universal metalogical principles of being, intrinsic to the nature of its reality. For instance, a prime principle of all directly observable/detectable matter is physicality. Thus, we can assume that the vastness and potency of hyper-luminal energy has properties that make it meta-solid, meta-liquid, and meta-gaseous hyper-plasma. So, it exhibits 2 main modes of energy density and magneto-dielectric interactivity, misnamed 'dark' energy and 'dark' matter. Yet, hyper-energy, energy, matter, and the cosmos-as-a-whole are emergent vibratory phenomena, full of all the forces and frequencies of energy and matter.

So, we can think of the undetectable hyper-plasmas resonating as hyper-harmonic overtones of Deuterium and Tritium (or of Hydrogen & Helium). That can be known because we can detect and observe the effects of hyper-plasma interacting causally with luminal plasmas, galaxies, and physical elements. Naturally, all the facts above are possible because of mentality, the prime metalogical principle of being that enables awareness, intelligence, mind, thought, knowledge, and understanding.

Therefore, we can also intuit and investigate the nature of the pure hyper-energy that fills approximately  $\pm 96\%$  of the detectable cosmos, while enabling and sustaining the other  $\pm 4\%$  of phenomena (which is  $\pm 95\%$  luminal plasmas).

We can also see the apparent disparity of luminal and hyper-luminal energy (and 'anti-matter') as an expression of meta-symmetry, not super-symmetry. In other words, the meta-material vastness of the hyper-plasmonic field is balanced by the explicate physicality of its lower-frequency (lower energy) luminal/elemental phenomena. (see defs. of Space, Reality, and Hydrogen)

**Spin:** This ontological definition of spin defines and explains it as the primordial form/mode of universal energy, enabled by integral enabling principles (of being and its nature).

Of course, we might suspect that pulsation or oscillation or precipitation could be the most primitive form/mode of motion (energy). We now see pulsation, oscillation, and precipitation everywhere, yet the most basic mode of motion that enables and sustains all other modes of motion (forms of energy) and physical processes is the axial spin, orbital rotation, and spiral/cyclonic vortical flow of energy that generates and sustains more energy (at all scales of form, structure, and functionality).

However, in standard model (SM) quantum mechanics (QM physics), spin does not mean spin (the rotation of physically 'real' things). Currently, SM "spin" is a term that signifies various measures and descriptions of incompletely yet statistically defined objects of QM models of

- a. hypothetical (conjectural) geometry
- b. fields (of theoretical configurations of mathematical objects), and
- c. partially observed field-effects (of undefined/ill-defined energy/matter)

So, though results of QM, quantum electrodynamics (QED), and quantum chromodynamics (QCD) are as impressive as the models' mathematical descriptions of objects (etc.), its fractional and integer unit 'measures' of SM 'spin' tell nobody anything definitive (about the whole realities of the field, its subfields, elements, and why they are as they are and do what they do). In fact, it helps believers think and talk as if invisible points of maths really have partial spin, gravity, colors, and electrical waves (without a fluidic magneto-dielectric medium).

For example, despite impossibility, QM believers say that the 'spin' of theoretical particles (of undefined stuff) is either fractional or whole number values. For instance, motion is motion. There is no half motion, nor any fractional spin. A thing either moves or spins, or it does not. Yet, QM's theorists neither define nor explain any processes or principles that cause a thing to have supernatural multi-spin, half-spin, and so on. Why not? It must be because QM experts know nothing about 99.9975% of the cosmos (reality) and the nature of its  $MDE^\infty$  field (of being). Why not? Because SM QM excludes adequate data, knowledge, terms, and definitions.

Why is that? Unfortunately, the sociocultural paradigm of current QM, and its domain of discourse, prevent using, thinking about, and discussing any realities and concepts outside its obsolete framework of theoretical reference. However, like all theorems and hypotheses, QM's perverted spin can be rehabbed and upgraded or discarded. Yes, it can be converted into a term referring to the real spin of actual plasmoids, vortices, and other energetic phenomena (caused by understandable, explainable properties and enabling principles).

So, in the case of protonic and neutronic vortices (nucleons, not particles), we can understand the observed "quantum states" of measurable spin as caused by the nature and conditions of the various intra-elemental subfields (radiation pressure gradients AKA SM 'electron shells') and the local external subfields in which they exist. Those 'quantum spin' field-effects are also the results of the various ratios of internal rotatory velocity and vortical and/or toroidal/hypertoroidal flow (through and around axial double vortices) of luminal and hyper-luminal energy. Yes, those rates of motion are enabled and determined by local (intra- & extra-nuclear) field-effects and the supra-elemental forces impinging on (and existing as) the local subfield of a nuclei or ensemble of nucleonic vortices (an 'atom'). To more easily understand that, we can use a quasi-fractal analog.

For example, though the sun is not exactly like an elemental vortice (a nucleon), a star is a plasmoid phenomenon, a sub-galactic  $MDE^\infty$  field-effect of universal energy. So, we can say that, in principle, the heliosphere is somewhat like a radioactive isotope of iron. We can visualize Earth as a protonic vortice, with the moon being its single, electron. Of course, for this Bohrian analogy, if we fail to replace the moon with a vortical flow phenomenon (of pure energy), then it suffers Bohrian defects. Thus, we may as well imagine Earth being made of pure luminal & hyper-luminal energy flow. Doing that, we can 'see' its EM &  $MDE^\infty$  field-effects as a subfield of the sun's subfield (of the galactic subfield).

In other words, we do an inverse, reductive extrapolation, down to the elemental and sub-elemental scales of energetic flow, form, structure, and functioning. So, in the macro-model analogy we see the complex, interdependent forces of EM effects, fluid mechanics, and the enabling  $MDE^\infty$  field-effects (of interacting subfields of the cosmic field of being's energy) embodying and/or expressing intrinsic enabling principles of being (and its nature). In the micro-scale model, the embodiments and/or expressions of being's nature and primal energy vary in kind and intensity, but not in principle.

We can now visualize the cyclonic/tornadic vortices and hydrodynamics of the various levels of form, structure, functionality, and interactivity in the molecular, elemental, and sub-elemental regimes (of the field of being) being a bit like planetary and solar 'weather' events (i.e., energetic field-effects), at least in principle.

Yet, the quantum numbers for QM 'spin states' need more explaining. First, spin is clearly not a state of a thing. It is an action, a mode of motion, which is a mode of energy, generally considered a form of kinetic energy. However, the old terms can be confusing.



For example, saying “kinetic energy” may lead to thinking that there are separate kinds of energy. Yet, it really relates to the forces and effects of energy we perceive/detect (and measure) being embodied and/or expressed in what we call mechanical phenomena. Yet, at the deeper levels of being, mechanical effects are all enabled by EM forces and effects, fluid dynamics, and intrinsic principles enabling the whole  $MDE^\infty$  field of universal energy (and all its subfields, including sub-elemental levels of energetic interactivity).

Now, consider quantum spin numbers and quantum ‘jumps’ of energy, electronic and photonic transitions (in particular). Also recall that neither ‘electrons’ nor ‘photons’ are isolated balls of stuff, and nor are they simply points of magical maths. So, there is clearly no good reason to assume different causal factors producing similar quantum limits. Thus, we can and should relate the intra-elemental field-effects with spin, wavelengths, frequency, velocity, energy levels, and reactions/emissions with extra-elemental (external local) field-effects. After all, even current SM QM theory claims that electrons (etc.) are field-effects (of energy, without bothering to fully define or understand energy and its source).

For instance, Einstein’s relating of frequency and proportional energy levels to the photoelectric effect (and quantum thresholds) was and is a very limited confirmation of the nature of energy and its  $MDE_{f\infty}$  (the ‘field’ of universal energy so incompletely defined and misunderstood in SM QM). A major part of the SM QM problem was and is defining time and space incorrectly. Calling time a physical quantity was and is both confusing and misleading. Thinking that space is an empty container of particles, wavicles, or bundles (packets) of ill-defined energy was and is equally confusing and misleading. Time—even its ‘operational definition (in the SM)—is a conceptual fiction. Space is a perception/conception of energy’s  $MDE$  medium, the omnipresent source of energy (enabled by intrinsic nonphysical principles, especially activity and functionality).

In principle, the pressure gradients, varying levels of energy density and interactivity) in Earth’s local field, from its inner core on out to the fringe of the Van Allen Belts, are somewhat similar to conditions at the elemental scale and beyond. In fact, especially at the nanoscopic levels, there is no difference between pressure gradients and their energy density. Their actual conditions and interactions are determined and limited by intrinsic principles that enable all physical form, structure, functionality, and interactivity. So, all the attributes of the  $MDE_{f\infty}$  and its energy can only be expressed and/or embodied in accord with the nature and ambient conditions of the eight (8) vibratory pressure gradients of luminal energy interacting with the ninth/zeroth ( $9^{\text{th}}/0^{\text{th}}$ ) regime of hyper-high frequency energy and meta-energy domains. Thus, we find 8 ‘electron shells’ and 8 ‘valence electrons’ and 8 ‘periods’ of subluminal elements.

So, there are no fractional spins or multiple spins of electronic, protonic, and neutronic points (SM ‘particles’), just varying rates of flow and rotational velocities of the various laminar and turbulent field-effects (of the different energy density gradients, not shells). Oddly, SM physicists and chemists talk about ‘electrons’ as if they are tiny, electrified planets or moons, but also as if they can fill their ‘shells’ or leave them empty. Naturally, the realities, observations, and data make more sense with fluid mechanics and energy density gradients, caused by resonant energy dynamics, vorticity, vortical motion, flow, turbulence, vibration, and radiation pressure.

Now, we can more carefully consider the original spin. Currently, SM ‘cosmologists’ believe it necessary to make up weird excuses for the “red shift” of light seen as coming from extraterrestrial plasma phenomena, galaxies, and stars as evidence of accelerating expansion of

the explosion of nothing that caused everything. Of course, the SM and all its additional hypotheses and particles seem to support the Big Bang of everything from nothing because the model and its exotic particles of maths were designed specifically to support all the popular mainstream assumptions. Yet, a more realistic explanation of the “red shift” and how the universe works involves its most common forms/modes of motion and flow: rotation and the vortical, laminar, and turbulent modes.

Granted, knowing exactly how purely nonphysical, metalogical principles and meta-energy caused the emergence (or precipitation) of either hyper-luminal plasma or physical forms/modes of energy (flow, spin, etc.) is as far beyond the domain of science as making models of universal totality exploding out of a point of nothingness. However, once the energy of being and physical potentials emerged, the most basic expressions of activity and interaction could generate the basic modes of motion, entraining more energy out of the hyper-luminal  $MDE^\infty$  regime of the field. Clearly, because of the enabling principles required, we can reasonably assume that spin was essential to the initial energy required for everything else.

So, instead of a residual ‘cosmic microwave background’ caused by an explosive magic expansion (before there was any place, time, and stuff to cause it), the basic heat energy of being’s  $MDE_{f\infty}$  (the ‘field’ and its activity) can be understood as an effect of its spin. Naturally, heat requires causes, interacting subfields, varying rates of flow, and the effects of turbulence (etc.). Obviously, the cosmos is the totality of such phenomena and their energetic emanations. It may even be possible that the overall spin of the cosmos interacts with the different rates of motion of its hyper-luminal and luminal subfields (another possible cause of cosmic heat).

That last conjecture may apply to unexpectedly hot ‘strange attractors’ (in what seem like the emptiest parts of the cosmos). The above theorems and hypotheses may seem hard to accept, but they are all clearly more realistic and reasonable than the nonsensical assumptions and claims of mainstream SM QM cosmologists.

**Particles:** In the mainstream ‘standard model’ (SM) QM (quantum mechanical) theory, a ‘particle’ is an undefined point that exists only in relation to other theoretical objects, including the [QM theoretic] field of nothingness, in which those points allegedly exist. Hence, they are all described by and per the rules of current SM QM ideas and beliefs.

For example, SM QM “points” are supposed to have various kind of spin, including “up” and “down” spin (without having any substance to spin). Allegedly, they also possess other properties, without possessing pre-existing intrinsic enabling principles (and substance), nor any causal processes that caused them to become physically real universal phenomena. So, evidently, SM QM theorists and SMRs must really believe that dimensionless points can be of various sizes, charges, abilities, functions, and powers without having any real substance or form (and definite intrinsic structure) to enable their properties and powers. Yet, they exist as QM objects because of assumptions about space, time, fields, and probable properties of particles.

In fact, the whole basis of modern QM theory depends on assumptions and arbitrary beliefs about probabilities, time, space, distance, metrics, and statistics that may or may not be totally reliable and valid for all time and all cases in all frames of reference (beyond those accepted as necessary and sufficient for SM theory). Clearly, the situation now fits Kuhn’s definition of science in crisis mode.

If that claim was untrue, then SM QM theorists could explain why and how points of

nothingness can have properties, functions, motions, and interactions that cause and sustain actual physical phenomena. Yet, they cannot explain all those magical powers of QM points, nor how they suddenly appeared in an original point of nothing, in the middle of nowhere. So, for a reliably useful, truly scientific definition of “particles” we need a good definition and explanation of their nature, and of what they are not. Now, first, we must distinguish purely theoretical particles from actual (or physical) particles.

Theoretical particles are mathematical or philosophical objects of consciousness and/or imagination (or delusion). They have no actual nature of their own, other than as objects or units of theory, enabled by mentality (etc.). They are defined or described in accordance with the terms, axioms, and rules of the theoretical domain of discourse that enables their mental (or illusory) existence.

Actual particles are constantly changing events enabled by the intrinsic principles of their nature, universal nature, and its field and subfields of magneto-dielectric energy. Whether we think of a grain of sand or the tiniest particle of an element, actual particles are field-effects, with actual form, structure, functions, properties, qualities, and potentials enabled and determined by natural principles and interactions with the field of being (and energy) that sustains them. Every physical thing—however tiny or solid or as vast as the cosmic field—is energy, a constantly changing form of energy.

Thus, all actual particles embody and/or express all or some of the principles and properties of physicality and natural actuality. So, in terms of modern physics, actual natural particles have mass and some intrinsic motions. They or their components can spin, sustain vibratory interactivity, and so on, because of their physical form (etc.) and energy. They all have mass because it (mass) is a measure of intrinsic energy enabling and sustaining their form, structure, and functioning. That is so because all forms of detectable matter are forms of energy, the energy of the magneto-dielectric field of being (the cosmos/universe, “ $U_{fo}$ ”).

Those essentials of actual particles are necessities because motion, vibration, spin, and velocity are expressions of energy. So, we can also understand energetic particles by seeing what they are not.

Thinking or saying that ‘photons’ are moving particles (points) of light without mass is as ridiculous as believing that neutrinos, gluons, and inflatons are actual particles—that move and cause physical effects—without the essential necessities that enable the energetic physicality of actual particles (vortices, vortices, etc.).

For example, because of the nature, dynamics, and actuality of  $U_{fo}$  (and its magneto-dielectric field of energy), we can perceive physical objects we call particles. Only the necessary physical constituents and intrinsic enabling principles of actual particles can make them possible, and truly real.

So, consider this, most of the particles we can see, touch, or smell and/or taste are made of physical substance, elements and compounds. Most such particles are made of an element or a chemical or crystalline ensemble of elements (molecules). Yet, we also conceive of objects with some virtual, mental, or hypothetical existence we think of as real. If we consider mental objects of consciousness as real constituents of our psychologically or mathematically real virtual reality, then they are virtually real, as such. That does not make them or our thoughts about them concretely real physical objects. Confusing the difference between actual and virtual objects and particles led to erroneous theory and hypotheses about particles.

Thanks to Democritus, et al, the particle theory of physics began thousands of years ago (in

ancient Greece via speculative thinkers in India). Sadly, the ancient Greeks suffered pandemic egomania and cultural chauvinism. That kept them from citing their foreign sources. Evidently, it also kept them from admitting that their ideas were merely mental. So, ever since, reductionistic-particulate materialism developed in several spurts, to the 20<sup>th</sup> century and beyond.

Now, the current standard model (SM) theory—mostly due to Maxwell, Thomson, Einstein, Lorentz, Rutherford, Schrödinger, Heisenberg, and Bohr—is popularly thought well-proven. Yet, more than a few problems, weaknesses, deficiencies, and defects remain. Thus, instead of decreasing, the SM anomalies keep increasing in proportion to the exponentially mounting new discoveries of astronomy, etc.

Still, quantum mechanics (QM) succeeds by supplementing particle theory with statistical maths, approximating probabilities, processes, and ‘behaviors’ of models of ‘atomic’ and subatomic particles (and their theoretical properties). SM physics also relies on ever more exotic hypotheses, normalizations, and renormalizations enabled by increasingly complicated maths, probability theory, and ever more approximations based on empirical data and preconceived SM interpretations (of the data) that best fit SM models and expectations. Of course, more than 1 (one) SM model makes all of them equally notional, and equally subject to falsification, ridicule, dispute, and/or disproof.

However, disputability of truly scientific theory enables progress to better, more explanatory theory, and to a more realistic post-modern era of physics and ontology. Unfortunately, the new old guard of the current SM resist every attempt to upgrade their ever more obsolete belief system (to retard progress to better science).

The alternative? Instead of imagining inflatons, gluons, strange quarks, and other tasteless yet flavorful or colorful subatomic ‘points’ (made mostly of nothingness and undefined energy), we can understand all energy phenomena and effects as artifacts of the turbulence, pressure gradients, and resonant regimes of energetic flow and vibrant interactions, or as vortices and vortices, vectorial vortical and quasi-toroidal artifacts of explosions. We need no causeless points of bigger magical points, nor any more fantastic excuses posing as well-founded scientific theorems.

Hence, we should abandon deficient QM hypotheses that require fudging and guesswork, while lacking elemental causality and satisfactory explainability. That will eliminate countless illusory, ever-increasing anomalies of astronomy (etc.) that disprove current SM pseudo-cosmology and its shibboleths. We can then build on what remains with good theory based on understanding enabling principles and evidence.

Then, what seem to ‘look’ and ‘act’ like particles can be seen as field-effects caused by all the interacting, co-emergent energy-flow phenomena sustaining the field of universal being. We can think of it as being like atmospheric or oceanic phenomena induced by thermodynamics, hydrodynamics, weather, earthquakes, volcanos, propellers, jet skis, etc. Thus, we could and should develop a new theory of quantum fluid mechanics (to replace QED, SED, and QM theory).

Of course, that could be insufficient, misleading/confusing, and unnecessary. Hyper-hydrodynamics, meta-fluid mechanics, better normal hydrodynamics, fluid mechanics, plasma physics, and magneto-dielectric field theory may prove sufficient and effectively satisfactory. That is so because the field of being already exhibits enough of its nature to understand its enabling principles and processes (for viable macro-ontology and a realistic QM).

**Elements:** The development of “Western” science and society led to the dominant concept of atoms of elements (mostly discovered by miners) recognized by chemists. Yet, the “atom theory” of matter may have began in India more than 3000 years ago. Nearly 100 years ago, Neils Bohr successfully promoted his solar system analogy for atomic form and structure. It required ongoing revisions, supplementations, and remedial efforts that led to ever more (not fewer) problems, contradictions, complications, and anomalies. That led to the current state of crisis and confusion maintained by mainstream QM physicists, cosmologists, et al.

So, to enable real progress to better understanding and results, a revised definition of “elements” is clearly necessary. As explained in the definitions of particles and fields, what we think of as the elements of matter are forms of energy, indeed, subfields of the field of being and its energy (AKA the cosmos). So, the nature of the physical elements is determined by the enabling principles of the field of being (its metalogical nature) and its  $MDE_{f\infty}$  (magneto-dielectric field and subfields). The nature of hydrogen, helium, and their plasmoid nucleic ions was explained in their definitions, but more insight can be gained with a more general explanation of current SM ideas and beliefs.

For instance, by SM convention, the ‘atomic weight’ ( $W_A$ ) of H equals the quantity of its 1 protonic vorticle (its protonic ‘nucleon’). So, its [relative] SM energy density number ( $D_{En}$ ) is approximated at 0.00008988, apparently much less than  $D_{En}$  of all other elements.

Yet, the ‘specific heat capacity’ ( $C_{Hs}$ ) of H is the highest by far, at  $14.304 = J/g(K)$ . However,  $C_{Hs} =$  quotient of potential activity/energy ( $E_{Pq}$ ), energy/voltage/power. Thus, except for pure uranium (U), H’s basic vibratory frequency and vortical energy ( $E_v$ ) is  $\pm 1,430.4\%$  greater than other elements—even from protactinium (#91) to oganesson (#118)—all having  $C_{Hs}$  and  $E_{Pq} \cong 0$ .

So, obviously, SM QM theorists and SMEs are missing and/or ignoring literally massive elemental realities. For example, uranium’s  $C_{Hs} + E_{Pq} = 0.116$  (and  $C_{Hs} + E_{Pq} = 0.0081096\%$  of H’s total energy quotient). That is so because the intrinsic enabling principles of  $U_{Ef}$  (the universal field of energy) make  $\pm 96\%$  of it a hyper-energy-dense domain of hyper-frequency (hyper-luminal) hyper-plasmas. Thus, the seemingly ‘heaviest’ elements of subluminal matter all have  $C_{Hs}$  and  $E_{Pq} \cong 0$  (zero, relative to the virtually infinite  $E_{Pq}$  and  $D_{En}$  of the field and local subfields). In fact, potential energy is a valid fact because nature’s enabling metalogical principles make it a property of physicality (itself a primal principle of being), enabled by the nature of energy (the expression of activity and primal functionality).

Yet, for complete analysis, to relate the modern SM elemental values to the hyper-high values of the 2 modes of hyper-plasma ( $E_{HP}$ ), we can use a rule of thumb rubric and the reciprocals of the values for mass ( $m =$  ‘atomic weight’  $W_A + E$  ‘density’). So, per SM theory,  $^1H$  has  $D_{Ea}$  of 11,135.857 and the SM value of  $EMF = \pm 10^{39} > G$  (gravity). Also, the  $D_{En}$  of  $E_{HPF} = \pm 10^{113} > U$ ’s  $m$  and  $D_{Ea}$ . Thus, the actual free energy values for both U and H  $= 1/W_A(1/D_{En}) + E_{Pq} \therefore$  (therefore)

$$\text{Eq. ?a, } U_{Ea} = 1/238.02891 \times 1/18.95 (= \pm 0.0002216) + 0.116 = \pm 0.1162216$$

$$\text{Eq. ?b, } H_{Ea} = 1 \times 1/0.00008988 + 14.304 \cong \pm 11,135.857 + 14.304 = \pm 11,150.161 \text{ and } \therefore$$

$$\text{Eq. ?c, } H_{Ea} \cong 959.388\% > U_{Ea} < E_{HPf} \in MDE_{f\infty}$$

In other words, per its nature (its intrinsic enabling principles)  $^1H$  has  $\pm 9.6$  times more potential interactivity ( $E_{Pq}$ ) and intrinsic energy than  $^{238}U$  (uranium) does. That value closely

matches the verified order of magnitude variations of elemental energy densities observed throughout the development of modern physics. Yet, recall that the total energy-density (and potency) of the magneto-dielectric field ( $MDE_{f\infty}$ ) is at least  $\pm 10^{152}$  times greater than  $G$  ( $g_{fe}$ ) and  $\pm 10^{74}$  times greater than EMF events. That explains why free H & H<sub>2</sub> so easily sink out of 'lighter', lower energy regimes, back into the harmonic resonance of the ultra-high-energy modes of the field.

In other words, the nature and local conditions (of the  $MDE_{f\infty}$ ) keep <sup>238</sup>U (uranium) so busy maintaining its form, structure, and elemental activity (as much as possible) its own potential responsiveness (free energy) is nearly 1/10<sup>th</sup> that of hydrogen. Despite its radioactive dissipation of energy, the nature of <sup>238</sup>U lets it resist 'external' field-effects, making it less resonant. Clearly, the massiest, seemingly heaviest elements have the least energy densities because of what we can loosely consider the braking effects of their somewhat turbulent, and slower (unstable) rates of internal flow and vibration.

Of course, E's nature loathes such restraint, which causes such high-energy emissions (when E wins the struggle to escape confinement). In principle, it could be similar to the corona, coronal discharges, and mass ejection events of the sun. Yet, remember that the elements (etc.) exist in an omni-dimensional sky-ocean of energy, with a triune regime of energy levels (a trinity of vibratory pressure gradients). Also recall that 'our' luminal regime has sub-gradients. They enable and sustain the form and resonance of each element. The more harmonic the resonance, the more stability; and the more dissonance (noise), the less stable the element (or isotope). A very limited analogy is massy complexes of effervescent bubbles rising out of the depths of the field, into the less dense strata of matter.

So, for deeper insight and satisfactory explanations of elemental forms and functions (even without any materialistic analogies, like quantum droplets and pilot-waves on the 3D surface of a pond of QM oil) we can now reconsider the basics, hydrodynamics, and relational potentials of H<sub>2</sub>, O<sub>2</sub>, and He (and superfluid <sup>3</sup>He & <sup>4</sup>He). First, we can now see G effects in massy, relatively chaotic galactic, stellar, and planetary gradients as dissipative side-effects of those noisy, more dissonant subfields. Hence, the proportionally less G effect beyond a planetary or solar (or galactic) subfield is due to the greater resonance of the greater levels of energy density. The acceleration toward less dense regimes (or other less dense forms of matter) is clearly caused by the radiant emanation (pressure) of the triune field (of luminal and hyper-luminal energy) surrounding and sustaining everything and every body.

So, we can think of our weightlessness beyond the interface of Earth's more massy domain as somewhat like floating in super-salty water. Although it seems upside-down and inside-out, we can think of our acceleration out of the denser energy—beyond Earth's noisy, massy (fluffier) gradients—being like bubbles of CH<sub>4</sub> (methane) rising out of the seabed, then breaking free, merging into the atmosphere. We can also understand instantaneous effects 'below' the elemental nano-scale level of form as field-effects of the 2 hyper-dense hyper-plasma regimes.

For example, if we push on a beach ball (or a ball of plutonium), the diameter is irrelevant. A point on the opposite side of the ball moves simultaneously, the same distance, at the same rate. If our cue stick puts a spin on the ball, it can be seen on both sides as it moves. Of course, obviously, hyper-frequency hyper-energy is not exactly like water or a billiard table. It exists within and around all things, and must be at least as large as the cosmos. So, clearly, hyper-field fluid mechanics and potentials transcend the limitations of QM field equations and Einsteinian 'relativity' theorems.

Now, in the absence of counter-acting forces and superseding interactions, ‘free’ H needs to form molecular H<sub>2</sub> because its enabling principles, natural forms, ways, harmonics, and constraints make its central dual-vortices and its quasi-spheroidal EM potential most likely to combine with a twin, forming an entwined (non-entangled) pair. Yet, recall that isotopes and molecules of H are interactive field phenomena, effects of the magneto-dielectric energy continuum of the cosmos (not tiny balls in a magic maths continuum of nonexistent time + perceptual or conceptual space).

Why does being (the universe) like plasma and H and He and O so much? Remember the totality:

$$\text{Eq. ?}, (E_U + MDE^\infty) \approx MDE_{f\infty}$$

So, the cosmic field oozes energy and interacting, intermingling forces, super-high & hyper-frequency standing-waves, harmonics, interference patterns (of interpenetrating wave-fronts), vortices, laminar flow regimes, and turbulent effects. That is true at all scales, from the subatomic to the biggest galactic vortices and deepest extra-galactic regions of the cosmos.

How can we be sure of that? Because we see it in all observations (at all scales) of physical events (field-effects). Now, recall that O is a writhing, knot-like ensemble of 8 protonic vortices (dual-vortex hydrogen nucleons), but with greater mass-energy (‘atomic weight’ 15.999) per nucleonic vorticle, and  $\pm 15.89$  times the  $D_{En}$  (standard energy density) of free H.

Why? Obviously, in relation to its ‘external’ local subfield and the  $MDE_{f\infty}$  at-large, O is like a complex of bubbles roiling with twice the massy (entrained/captive) luminal energy and ‘internal’ hyper-vortical flows of four H<sub>2</sub> vorticles (‘molecules’). In other words, the resonant harmonics, intensities, and ‘scalar’ vectors (of ‘radiant’ emanations) of the  $MDE_{f\infty}$  cause the forms, structural properties, functions, and relational potentials that determine the nature of oxygen and its compounds.

So, O and O<sub>2</sub> are so energetically reactive because oxygenic field phenomena are normally in a fragile balance between ‘internal’ & ‘external’ turbulence and orderly flow. Clearly, that can only be because of O’s nature and its harmonic relationships with its mates and its progenitor, H, and because of the nature and conditions of the all-pervading, all-empowering energy and hyper-energy of  $MDE_{f\infty}$  (the field of being). Now, also recall that the actual internalized energy density of O (relative to hyper-plasma,  $E_{HP}$ ) is the inverse of SM mass- $D_{En}$  values.

Therefore, H is really 16 times more energetic than O, making its relations and bonds with O and O<sub>2</sub> so intensely energetic, powerful, strong, and durable. Hence, they confirm this theory and metatheory (and the fact that nature dislikes a lack of spin and flow even more than it loathes vacuum).

So, bear in mind the analogies—with suns, magnetospheres, bubbles, and water—and we see that H<sub>2</sub>O is so hydrogenic, so fluid, with such great integrity and ‘surface tension’ because its nature, form, structural properties, and functional potentials force it to merge with its molecular sisters, forming a single, fluid field that resists dispersion by more turbulent, dissipative local field phenomena. Remember, the expansion ratio of the vapor phase transition of H<sub>2</sub>O (from liquid to steam) is 1325:1, while combustion of gasoline (and oxygen) expands at a rate of only 347:1, i.e., a difference of nearly 4 to 1.

That confirms the intrinsic energy and inherent power of H<sub>2</sub> and H<sub>2</sub>O—due solely to their nature and the intrinsic metalogical principles enabling and empowering them and the rest of the field (cosmos, universal totality). The hyper-liquidity of super-fluid <sup>3</sup>He provides another

confirmation of the real nature of elemental and protonic plasmoids (ions/nucleons), their activities, and their intrinsic enabling principles. However, for optimum understanding, we can refer to water again. For instance, though fluid H<sub>2</sub>O is an incompressible liquid, it can expand. That is a nontrivial example of the power of the enabling metalogical principles sustaining the nature and properties of the field and all elemental forms of its energy.

In fact, the greatest rise in average sea-level is at Earth's equator, because liquid H<sub>2</sub>O can expand. The cause of H<sub>2</sub>O's great tropical expansion is a magneto-dielectric field-effect, not the effect of the moon's G ('gravitic' force). Now, remember, a force is an effect of energy, a field-phenomenon. Again, also recall that per the SM

Eq. ?,  $EMF = 10^{39} \times G$  and that  $E = mc^2 = EMF + G + E_{HPf} \equiv MDE_{f\infty} \therefore$

$$E_{Zp} \equiv E_{HPf} = \pm 10^{113} + EMF = \pm 10^{152} \times G$$

In other words, elemental energy is the magneto-dielectric field (of light, etc.) plus its integral hyper-plasma energy plus the force of gravity plus the EM electro-motive force. Therefore, since  $E_{Zp}$  ('zero-point' energy, at 0°K) is strictly equivalent to the energy of the hyper-frequency hyper-plasma field, hydrogen and water responds to Earth's local field phenomena and other *MDE* events, accordingly. Also, since the energetic domain (field) of hyper-plasmas ( $E_{HPf}$ ) is in, and around, and enabling all phenomena, while sustaining  $\pm 10^{113}$  more hyper-energy than an equal quantity of all the transuranic elements combined. So, clearly, the moon's EMF effects on the interacting heliospheric+galactic *MDE* subfields, and upon Earth and all its field phenomena, is  $\pm 10^{39} \times$  greater than the lunar G (side-effect of its interaction).

So, we can also admit that the moon's braking effect on Earth's rotation (reducing its field strength, intensity & magnitude) is primarily an effect of its EM electro-motive force, not gravity (a side-effect of interacting *MDE* events). That causes the stretching of the vortices maintaining H<sub>2</sub>O and, thus, the 'swelling' of tropical salt-water (even without petrocene GHGs and extra heat). In other words, *MDE* processes cause the tides and higher tropical sea-levels.

Clearly, instead of using only quantum statistical methods to approximate unintegrated, isolated, and disintegrated elemental vorticals (that spew out of man-made explosions and thermonuclear implosion events, supernovas, etc.), we can understand the actual nature of the elements from the relations and transformations of all 3 forms of H and the 7 forms of He. So, without nonsensical ideas posing as explanations (of uncaused particles and a big bang creation story that 'begins' with an explosion in the middle of nothing, in the absence of energy and something to react with, to make magic gluons, etc. (and H protons out of those teeny-weeny bubbles of nothing)), the realities can be understood as indicating the intrinsic presence of natural metalogical principles. They enable the meta-energetic and hyper-energetic, proto-physical meta-material, hyper-plasmas, and intrinsic potentials.

All the intrinsic principles and potentials of being empowered the original spin, flow, turbulence, and precipitative co-emergence of the elemental forms of energy. They enabled and sustain this lower  $D_E$  mode of the  $MDE_{f\infty}$  which we can detect directly.

So, instead of visualizing neutrons and electrons as material particles, we can 'see' the isotopic forms, modes, and ways of H and He. They express the fact that they are fluidic effects of the interactions of the  $MDE_{f\infty}$  (and its local subfields) with the intrinsic energy intensities, vorticities, velocities, vibratory amplitudes, and forces generated by the toroidal and vortical flows that give all elemental field phenomena their unique characteristics.

Now, we can replace tiny balls of unexplained (and insufficiently explained) stuff and 'dark'



stuff with active interfacial vortices and vectorial potentials of interaction, integration, and disintegration of pressure gradients and flow regimes. Again, the apparent emission of particles is caused by perturbations of the ‘internal’ form, structure, functions, and integrity of the elements, and of (or by) the ‘external’ local field. For example, envision a gamma ray as an ultra-high frequency femto-vorticle of hyper-plasma ejected from an ultra-high energy event at an ultra-high velocity. Naturally, it leaves an ultra-high frequency, ultra-high energy ‘trail’ as its vectorial dual-vortex tunnels through the hyper-plasmonic and elemental ‘material’ field of universal energy. So, it can seem to behave like an ultra-high velocity particle of stuff, with qualities that give cosmic ‘rays’ and ‘gamma’ and neutrino vorticles the properties found by observation, measurement, and maths.

The actuality is that ‘neutrinos’ and ‘gamma rays’ are—like all other energy events—interactive field-effects. All such rays are the result of events that cause penetrative vectorial vortices. Some traverse the vastness of the  $MDE_{f\infty}$  and countless interacting, interpenetrating subfields. In fact, when the energy involved is sufficient, vectorial interaction across vast ‘distances’ can happen instantaneously because what seem to be particulate sources and recipients are not and never were separate from the unitary  $MDE_{f\infty}$  and its enabling meta-energy. In other words, in that case, since the source-level core of every form of energy/event (subatomic, etc.) is hyper-luminal, meta-luminal, and unitary, the luminal speed-limit is irrelevant. So, no ‘entanglement’ of ‘particles’ ever happened because they never existed as separate, isolated objects (accidentally spinning & vibrating in nothing).

Finally, the nonphysical elements—the intrinsic metalogical principles of nature—enable, sustain, and determine the forms, modes, and potentials of all other things (including awareness, mind, thought, and science). Accepting those facts and realities, we can understand elemental matter as results of the relationships and interactions of the various levels, densities, modes, and forms of nature’s energy. That also lets us understand why the universe is  $\pm 96\%$  hyper-luminal energy and why  $\pm 95\%$  of what we see (or detect) is plasma (protionic/electronic energy). That eliminates the need to believe in accidental, inexplicable, god-like numbers and symbols (G, c, etc.). (see def., Mass & Matter)

**Mass:** As shown in the definitions of energy, matter, particles, force, and spin, “mass” became confusing. Mass is too often confused with ‘physical’ matter, instead of being understood as a label for what it represents, a measure of integral energy. In other words, all the modes and forms of ‘internal’ energy that sustain any form of matter, give it its overall measure of mass. So, instead of limiting ourselves to current SM QM and Einstein’s equations, we can more easily understand mass with

$$\text{Eq. ?}, \mathbf{mc}^2 \equiv \text{EMF} + G + E_{HPf} = \mathbf{E}_{\lambda v}(V_{vT}) \approx MDE_{f\infty}$$

Briefly, although it implies an observer (a being, or consciousness), mass times the speed of light squared is strictly equivalent to the integral combination of the electro-magnetic forces, gravitational acceleration (dissipation, etc.), and the energetic action/reaction of the hyper-plasma field. So, it also equals the required energy per wavelengths and frequencies times the total vortical velocity of enabling flow. Of course, the dynamic nature of the magneto-dielectric field’s activity enables rotation, laminar and vectorial vortical flow, but also turbulence, thus vibration, pulsation, and oscillation. Therefore, also being essentially unitary, changeless, and infinite, it ( $MDE_{f\infty}$ ) cannot precisely equal its luminal/elemental subfields of emergency, form, and so on.

**Light:** The SM claims that light is electro-magnetic waves and/or points (photonic ‘particles’ or wavicles or packets or bundles) and/or “rays” of undefined energy or matter. Of course, SM QM SMEs also seem to know that all such forms/modes of energy are effects of a field of “EM energy” (somehow sustained in a mysterious, unexplained nothingness or  $\pm 96\%$  vacuum). They also believe that, like other waves, the waviness of light ‘behaves’ in a similar manner, with and without a sustaining medium (an actual ‘field’ of something that can be affected in ways that cause waves). All that contradiction and lack of definition maintains mainstream scientism’s ongoing crisis of confusion, incredibility, and absurdity.

Apparently, its visibility, detectability, measured actions, and effects make light’s nature seem self-evident. Clearly though, depending on the consciousness, knowledge, and beliefs of an observer, light is usually not what it seems. For example, while thinking of it as ball-like points or packets of stuff (‘EM’ energy/matter) or waves of nothingness, it became nearly impossible to see and understand the various modes of light as emergent effects (emanations) of interacting subfields of the magneto-dielectric field ( $MDE_{f\infty}$ ) of being.

Soon, the ancient ‘aether theory’ (of a fluidic universal sky-ocean of energy) lost out to spooky maths, illogical geometry, and a new sense of sciencey certainty about weirdness. So, light seems to need a speed limit, despite the fact that waves and their speed happen only in and because of a medium (which does the waving). Of course, mainstream believers also ignore the fact that  $c$  is defined per arbitrary (and deficient) definitions of time and distance as seconds and meters (or hours and miles).

Conveniently, mainstream believers also ignore 2 other facts: a) ‘time’ is a conceptual construct that thingifies our limited perception of momentary change, and b) space is a concept and a perception of an attribute of the  $MDE_{f\infty}$  (field) or a local ensemble of subfields (a place). Naturally, ignoring those 2 realities makes it impossible to see the modes of light as results of the interactions of the subfields of the  $MDE_{f\infty}$  (of its luminal and hyper-luminal regimes). Yet, mainstream astronomers realize that the ‘dark’ hyper-luminal modes of hyper-plasma are powerful enough to cause the galaxies to disobey the rules of mainstream ‘cosmology’ and obsolete theory.

Still, like fish who never know about water, mainstream believers refuse to admit that their beliefs and rules may be so deficient that they prevent progress to a vastly superior science, much better STEM education, and a new era of sane civilization.

**Plasma:** Astrophysics tells us that plasma amounts to  $\pm 96\%$  of all physical matter. Yet, QM ‘cosmologists’ mostly ignore fluid mechanics, electrical engineering, and plasma physics.

So, mainstream QM cosmology’s definitions and descriptions of the most abundant mode of matter leave much unsaid and unexplained. Saying that plasma is both electronic and ionic calls for better definition and explanation of electrons and ions. (see defs., Particles, Hydrogen)

However, the verified properties, normal relations, and potentials of ions and electrons discovered by experiments and described by QM physics are already fairly well-known. So, this macro-ontological definition of luminal and hyper-luminal (hyper-frequency) plasmas focuses mainly on the hydrodynamics of their fluidic, ultra-fluid and hyper-fluid modes.

The terms are critical, for the observed nature, modes of flow, radiance, luminosity, and EM activity of plasmas make it clear that their fluidity be considered the key characteristic necessary for full understanding. For example, radio-astronomy enabled an image of the

spheroidal region of the cosmic field ( $MDE_{fo}$ ) currently detectable; and it looks like a brain-like web of twisting, writhing filaments, and currents of luminous liquid or neural networks. Yet, instead of seeing the hydrodynamic nature of the fluid mechanical sky-ocean of plasmas and hyper-plasma (now AKA 'dark' energy & matter), mainstream QM theorists and 'cosmologists' prefer thinking about nanoscopic sub-particles and probabilities.

Of course, ignoring all the flow, motions, interactions, and colossal forces of the ultra-high energy of the  $MDE_{fo}$  and its hyper-high-energy action/reaction events makes it nearly impossible to understand how they affect the nanoscopically tiny, delicate sub-fields of the quantum level (of the field). So, to understand it, we must abandon the refusal to consider the realities of the whole of the field, especially its basic, fluidic, and hyper-fluidic nature.

We must also drop the normal SM habit of pretending that the field, its subfields, interactions, and effects exist in isolation. Seeing only imaginary billiard balls in empty space in a mental model prevents seeing the universe's fluidic sky. In the depths of the  $MDE_{fo}$  and its interstellar and intergalactic subfields (and currents of plasmas, galaxies, galaxy clusters, etc.), its reality and enabling principles make it obvious that all its forms, modes, forces, and events are interdependent and simultaneously interactive.

Therefore, instead of an approach like exploding water to see isolated atoms or molecules, we can consider the principles and modes of magneto-dielectric interaction that enable the fluid nature and hydrodynamic flow of plasmas (and hyper-plasma). Hence, it's reasonable to call the hyper-fluid hyper-frequency regimes (of the cosmos) hyper-plasma, not 'dark' energy/matter. We know that because it causes observable effects of fluid mechanical interaction with and in a) galaxies, yet also with b) nebulae, c) colossal plasma currents of galaxies, and d) with giant plasma filaments enabling star-formation.

We can also be sure of the hydrodynamics because all of the field-effects in the  $\pm 93$  billion LY bubble of detectable phenomena are entering, leaving, and flowing across the field from sources, towards terminal locations. So, seeing and thinking about the cosmos as a vast sky-ocean of magneto-dielectric energy is realistic and very helpful. Luckily, SM astronomers and physicists looking for evidence of 'dark' stuff, found evidence of fluid mechanical interactions with, within, and around galactic subfields, including this one. Also, since  $\pm 96\%$  of the cosmos is hyper-luminal plasma, and  $\pm 4\%$  is  $\pm 96\%$  luminal plasmas (mostly hydrogenic), and the majority of the other  $\pm 5\%$  (of matter) is hydrogen, it seems best to accept the fundamental ubiquity and omnipresent effects of hydrodynamic principles, from the quantum right up to the sub-/supra-quantum, hyper-luminal levels of scale.

So, plasma and hyper-plasma phenomena are fluidic field-effects, enabled and sustained by the magneto-dielectric energy of the field of being, per its intrinsic enabling principles. So, we can understand the electro-magnetic and thermodynamic forces/effects of plasmas and hyper-plasma as results of their modes of activity (motion, flow, etc.), and their subfields' interactions. (see defs., Fields, Force, Energy, etc.)

**Force:** A force is a property and effect of energy; and energy is omnipresent. So, there are no isolated, independent forces sustaining the forms and modes of elemental matter.

Labeling different 'kinds' of force, as if they are isolated, tends to confuse the forest of energy with the trees. What seem to be separate forces—a 'strong' force, a 'weak' force, 'gravitational' force, and electromagnetic force—are all just effects of interacting, interpenetrating vortices, currents, and expansive magneto-dielectric subfields of energy and

hyper-energy. Those enabling forms and modes of energy are field-effects ( $MDE_{fe}$ ) of the cosmic magneto-dielectric field of being and its energy.

So, the 4 apparently separate forces of dominant QM physics are misconceptions and misinterpretations caused by exotic maths, deficient theory (mostly shots in the dark), conjectures, and inadequate knowledge based on fractional observation, defective linguistics, and deficient ontology. In other words, as Faraday and Tesla intuited, the all-pervasive, magneto-dielectric ( $MDE^\infty$ ) nature of  $E$  (energy) enables all subfields and all modes of energy, at all scales. It enables all observable forms, structural modes, functions, motions, and interactions of galaxies, suns, plasmas, elements, molecules, compounds, weather, prions, viroids, mitochondria, DNA, RNA, life, and us.

For example, the 'strong' force is actually just the stronger integrative effects of bi-directional protonic dual-vortices, their rates of flow, the momentum, velocities, intensities, densities, vibratory motions, and radiant emanations. They enable and are enabled by the 'internal' and 'external' pressure gradients of the local subfields ('inside' and 'outside' the elemental gradients of resonant energy density). That explains the activity and limits of elemental quanta and 'quantum leap' thresholds of transition and transformation.

Naturally, that applies to vorticity, spin, rotation, orbital velocities, and the angular momentum enabled. Thus, we can think of 'electron shells' as like nested bubbles, with internal harmonic (yet roiling) plasma pressure gradients/zones of density, resonant & turbulent activity, and force. 'Electrons' are like swirling femto-hurricanes on the interfacial 'surfaces' of the elemental bubbles of energy. Yet, they can align and merge with the electronic vortices of other elemental bubbles, enabling the connecting double-vortex of vectored flow (as subnanotornados of luminal energy and protonic hyper-plasma). The strength of the protonic and electronic flows and connections (of nucleons and/or molecular ensembles) are enabled by and depend on the protonic/molecular configurations and ever-changing conditions, caused and enabled by the nature of the field and its elements.

Consider a 'line of force' really being a twisted-pair of bi-directional (double) dual-vortices of energy, with hyper-plasma at the axial core. So, the transfinite axial line in the center of each filament is not simply a directional vector in 'space', but a hyper-powerful  $MDE^\infty$  effect of elemental interaction in and with the field and 'local' subfields. Now, as explained in the definition of energy, the misnamed 'dark' energy and matter are major modes of the  $MDE^\infty$  hyper-energy domain. The principles, properties, and effects of energy's  $MDE^\infty$  nature let the hyper-plasma modes interact with our more turbulent, slower, lower energy domain and elemental phenomena, 'inside' and 'outside' of every flowing protonic vorticle of elemental energy ( $E_{em}$ ). The nature of the field's  $MDE^\infty$  and EM field-effects, forces, flows, and potentials are what makes what we 'see' as twisted-pair dual-vortices of plasma (and 'lines of force') in a magneto-dielectric field tend to stay apart, twist, spiral and/or loop. So, they also tend to stay coupled with and by those interacting, seemingly 'internal' and 'external' forces of the field (and its nature).

The exception to that is the natural tendency of plasmas' twisted-pair double-vortices to come together as their energy, flow, and force grow beyond the point of balance. The interactive field-effects can then compress and constrict ('pinch') a segment of the plasma filaments. They then ball up, like a spheroidal knot of roiling vortical loops. That can then be pinched off, to become a micro-plasmoid (an elemental vorticle, proton, etc.) or a macro-plasmoid (a star). They can then be sustained by the  $MDE^\infty$  and EMF field-effects, galactic/extra-galactic currents, and

other effects of energy and hyper-plasma.

So, lines of force, 4 independent 'forces', 'quantum gravity', and gravity in general are clearly unnecessary flukes of obsolete maths and physics. Effects of  $MDE^\infty$  phenomena—plasmas, plasmoids (protons, suns, etc.), and elements—and all  $MDE^\infty$  field-effects can be understood and explained with hydrodynamics, fluid mechanics, and the maths of upgraded electrical engineering & EM theory. That is so because the field of being and its  $MDE^\infty$  are omnipresent, all-encompassing. They pervade, enable, empower, motivate, and enliven every domain, mode, and effect of energy and matter.

Hence, nothing is separate or independent of anything or everything else in subfields of elemental  $MDE^\infty$  and EM interactions (which are all that exists). Of course, force is also a concept and a functional principle that enables and sustains the activity and effects of energy. So, forces are effects of E, enabled and governed by nature's functionality, the metalogical principle that enables activity. (see defs., Energy, Matter, & Activity)

**Hydrogen:** The most basic, simple, abundant, elemental form of energetic matter—other than plasmas—is  $^1\text{H}$ , hydrogen, AKA protium (or proton, the prototypical ion).

All 3 names are appropriate, for  $^1\text{H}$  has the unique distinction of being the required essence of water's fluidity and, also, the most prototypical protonic plasmoid enabling energy's other, more complex elemental nucleons. In other words, all other elemental nuclei are ensembles of proton ( $^1\text{H}$ ) nano-plasmoids. Some of them have higher energy hyper-plasma flow (in their axial vortices), 'neutralizing' their 'positive' charge (making them act and 'look' like neutrons). Now, recall that the activity and effects of 'dark' energy/matter demonstrate the omnipresent reality of the hyper-luminal (clear light) of hyper-plasma. So, just as every proton is a nearly identical 'ion' of  $^1\text{H}$ , all 'neutrons' are really higher energy protonic plasmoids, as in  $^2\text{H}$  (deuterium) and  $^3\text{H}$  (tritium).

There are other previously unexplained facts and causes for all the distinguishing properties and actualities of hydrogen. For example, its unique priority as the most primitive element of matter is no accident. So, the nature of  $^1\text{H}_2\text{O}$  being as it is, the most basic expression of liquidity (the principle), fluid dynamics is also called hydrodynamics. Thus, all energetic phenomena, interactions, and field-effects can be described with the terms of fluid mechanics.

Another actuality of hydrogen is its magneto-dielectric susceptibility to axial alignment with electromagnetic subfields. That confirms the pervasive magneto-dielectric field and intrinsic forces that enable all hydrodynamic flow regimes. So, that enables energetic events at all levels and scales of phenomenal form, structure, function, complexity, and actuality. In other words, the hydrogenic properties of hyper-plasma, plasma, and elemental energy flow enable the more complex forms of elemental matter.

Now, in its  $^1\text{H}$  form, hydrogen needs no 'neutron' because its protonic vorticle (and its internal hyper-plasma dual-vortex) is the perfectly balanced, massy, vortical flow phenomenon enabling all protonic nano-plasmoid form, structure, function, and activity. So, that makes  $^1\text{H}$  the prototypical nucleonic vorticle that enables more complex elemental forms (of matter). In those elements, due to meta-fractality and nature's other primal principles, the electronic interfaces of protonic domains merge, somewhat like the merging of (molecular)  $\text{H}_2$  (or  $\text{O}_2$ ). Hence, per the enabling principles, depending on the conditions and interactions of the intra- and extra-elemental subfields and the quantity of positive and/or neutral protons (in an elemental ensemble), the nature and energy density of the field (of hyper-plasma) permits up to

8 electromagnetic subdomains per multi-protonic element.

Briefly, a plasmoid 'neutron' of  $^2\text{H}$  or  $^3\text{H}$  is really the hyper-luminal vortex that flows and spins faster than the luminal energy vortex it enables and sustains. So, a proton's magneto-dielectric ( $MDE$ ) force and power ( $\text{EMF} + V$ ), and its relative non-neutrality is due to meta-symmetric relativity, asymmetry, interactivity, and the lossier bi-directional vortical flows of its hyper-luminal axial core. So, the energy/pressure/flow regime of the  $E_{\text{em}} + MDE^\infty$  field sustains  $^1\text{H}$  protons (from within and outside its elemental domain).

Clearly, the principles enabling basic protonic plasmoids that enable the 3 isotopic forms, structures, and functions of H, also enable the other modes of the other elemental nuclei. Hence, hydrogen is rightly considered the prototypical kernel of all other elements. So, it makes sense to assume that its 3 forms are due to its resonance with the 3 fundamental frequency domains of the field: the basic vibratory/radiant energy of our mode of being, and the 2 hyper-plasmonic modes of the  $MDE_{f\infty}$  (field). That and its 3 forms/modes, structural configurations, and functionalities also reflect hydrogen's primal expression and embodiment of primal unity, duality, triality, trinity, triadic and quadratic structural logic (in  $^{\circ}3\text{D}$ ). That is so because its nature and basic hydrogenic morphology physically, energetically unite primal singularity and duality.

Hence, deuterium,  $^2\text{H}$  or D, embodies and expresses primal triality with 1 protonic vortical and an equally powerful, 'internal', electromagnetically 'neutral' dual-vortex of hyper-plasma, with only 1 coronal-interfacial electronic potential. In other words, its more massy internal flows and activity gives  $^2\text{H}$  approximately twice the apparent field strength of H (while remaining relatively stable). That makes it seem as if it has an extra 'nucleonic particle' (a neutron).

Free tritium,  $^3\text{H}$  or T, embodies and expresses primal quadrinity and tetradic morphic-structural logic, with 1 protonic (dual-vortex flow) and, apparently, 1 electron (with 2 coronal energy potentials). Hence, the 'local' energy density, vibratory and rotatory phenomena, harmonic resonance, turbulence, and pressure (of the  $MDE^\infty$  field) pump H into its less stable, unsustainable levels of energetic activity,  $^3\text{H}$  (or  $^2\text{H}$ ). Thus, when  $^3\text{H}$  loses enough 'neutral' hyper-energy and merges with another  $^3\text{H}$  plasmoid, it becomes the more massy He. That shows that mass is simply a measure of entrained, constrained energy sustaining the forms, modes, and ways of ions, elements, plasmas, galaxies, stars, planets, and other forms of energy.

The rarity and dissipative instability of  $^3\text{H}$  confirm the intrinsic principles and properties of H that sustain its form, priority, and status as the prototypical element that resonates with the most powerful, pervasive frequencies of the  $MDE^\infty$  field. Thus,  $^3\text{H}$ 's 2 'phases' (forms & modes) and levels/ways of activity (energy density, intensity & harmonics) clearly confirm causal interaction with the 2 major modes of hyper-plasmas (misnamed 'dark' energy & matter).

Why and how? Because all forms, modes, ways, and effects of energy are enabled and determined by their intrinsic principles, enabled by the fundamental metalogical principles of being. So, this view of elemental actuality accords with the abundant evidence of nature, form, structure, functionality, and hydrodynamics of the tri-modal field of E (and its semi-cubic/tetramorphic hyper-physical infrastructure).

**Helium:** He, the element, is a model morphic seed-form of  $\text{H}_2$  (the natural molecular form of hydrogen). However, though He (like  $\text{H}_2$ ) is an elemental embodiment and expression of its intrinsic enabling principles (of natural metalogic). Its 9 forms (isotopic variants) are field

phenomena enabled by the nature and potentials of  $MDE^\infty$  energy and co-emergent interactions of and with the bi-modal  $E_{PH}$  (hyper-plasmonic) domain of the actual field of being ( $U_A$ ).

This approach to elemental ontology is supported by the SM finding that, as radioactive elements decay, they emit helium atoms. Yet, modern SM doctrine fails to explain why, and what that really means.

What it means is that, just as singular vortices (atoms) of hydrogen (and its enabling hyper-fluid hyper-plasma's hypertrochoidal, toroidal and hyper-paraboloid flows) like being coupled with a vortical double, helium vortices like being coupled with at least one partner. So, clearly, the 2 nondual protonic vortices of helium like to be coupled in their more materially resonant flow regime, determined by the local and universal field phenomena and their nanoscopic, picoscopic, and femtoscopic effects.

For example, as we see with hydrogen and its [isotopic] variants, the 9 heliums embody and express the primal, enabling, characteristic principles of energetic elemental matter that make helium 'look' and 'act' like helium. So, we might relate the 2 modes & density regimes of hyper-energy/matter to hyper-plasmonic hydrogen and hyper-plasmonic helium. Whatever the case, we cannot verify that conjecture directly. So, we can only analyze the circumstantial evidence. We can start by looking for reasons why hydrogen needs no neutron, then intuiting what neutrons and electrons really are.

So, as claimed for hydrogen, a lone protonic vortical plasmoid's axial flow is enabled by the neutral, contra-rotatory, bidirectional, double-helical vortices of  $E_{PH}$  flow. However, in the nuclear domain of He, the resonant harmonics, pressure gradient, and surrounding turbulence of the  $MDE^\infty$  field enforce the characteristic form interpreted as neutral vortical plasmoids coupled to the 2 protonic vortices of the helium ion. Yet, if such a neutral complement of protons exists as an independently, concretely real object, then there should be a satisfactory explanation, including causal factors.

Of course, these theorems and metatheorems can be falsified, like all truly scientific theorems, but neither SM cosmology or physics offers a satisfactory substitute, nor a valid disproof. In fact, like all valid metatheory congruent with actual universal phenomena and their nature, the metatheorems presented here are falsifiable only with fallacies. Thus, this work of metatheory presents viable, valid, logical and metalogical definitions, causes, and explanations of enabling metalogical principles.

For example, this  $(E_{em} + MDE)^\infty$  domain of the magneto-dielectric field of being sustains H<sub>2</sub> and all forms of He as the lightest forms of elemental matter ( $E_{em}$ ). However, relative to the hyper-plasmonic mode of the field of being, the dyadic 'positive/negative' EM charges, flows, interactions, and forces of the  $(E_{em} + MDE)^\infty$  field are counteracted or canceled by the opposite contra-rotatory flows and spins of the hyper-energetic  $E_{PH}$  mode of  $U_R$  (universal reality). That makes hydrogen the most energetically resonant, relatively energy dense form of elemental energy. Thus, H sinks into (*i.e.*, escapes) the oceanic hyper-energy of the extra-planetary field more easily than helium.

How and why should that be possible? We only need to observe the macrocosmic and nanoscopic evidence, and consider the actualities with an open mind, free of obsolete hypotheses, doctrines, dogmas, and shibboleths of QM cosmology. We can also review the absurdities of current QM physics and faux-cosmology. (see defs., Plasma, Fields, Energy)

**Measure:** So far, the definition and reality of measurement has been largely ignored by almost

all SM QM researchers and many mathematicians. So, general understanding of the field of magneto-dielectric energy ( $MDE_{f\infty}$ ) was prevented.

Worse yet, not understanding the nature of measurement supports misunderstanding of  $MDE_{f\infty}$  energy events, numbers, consciousness, and reality. That occurs mainly because the consciousness (conceptions, perceptions, and knowledge) of most researchers causes some confusion of resulting data and interpretation with the phenomenal reality studied. In other words, failing to know and bear in mind the reality of measurement always supports the error of thinking and acting as if our numbers are what they quantify, our maps are the territory, and models are as valuable as the fraction of reality they partially approximate.

For example, a measure of a thing or process assumes some consciousness of it, without any explicit account of how little of it is perceived. Clearly, we normally fail to realize how much of what we observe remains unknown or unknowable. Currently popular mainstream SM QM and 'cosmology' are perfect examples.

On the other hand, macro-ontology lets us approximate how much of reality is either unknown or unknowable per the rules and limits of mainstream QM. Its view equals less than  $\pm 95\%$  of  $\pm 5\%$  of  $\pm 4\%$  of universal totality, which equals  $\pm 0.0025$  of 1% of reality, per the SM's own results and measures (of quantities). Actually, QM deals with far less than that, because it totally misses the huge percentage of qualitative realities (and other nonphysical elements of reality) that make the universe, being, and life what and as they are (in each ever-changing moment of presence).

**Observation:** Observing is an event and process enabled by perception, which is enabled by sentient being, awareness, conscious intelligence, mind, and embodiment. They express and are enabled by naturally intrinsic metalogical principles: mainly actuality, mentality, activity, and awareness. However, perception and observation may be inaccurate, illusory, and limited by existential conditions or the conditioning of observers, and the limitations of their minds and senses.

In other words, there can be no isolation or separation of subjects and objects, or self and world, microcosmic phenomena and universal being-as-a-whole. So, clearly, the critical importance of defining observation and, hence observers, is necessary for all the sciences.

That is true because understanding observations and objects requires a good understanding of the actualities and limitations of our observations. For instance, Einstein's famous reduction of energy and matter to  $E = mc^2$  required and assumed the existence of observation, a conscious observer, the observer's frame of reference, and space, and time. Yet, post-Einsteinian physics lacks definitions and optimal recognition of all those terms and basic requirements. So, to this day, Einstein's postulates are normally accepted (as necessities of life, science, and maths), without looking deeply into what enables their actualities and potentials.

For example, an astronomer may observe an unexpected phenomenon that proves the basics of QM physics and cosmology absolutely invalid. Yet, in those cases, the astronomer has no concepts or valid theory to 'make sense' of such phenomena. So, she/he misinterprets what is really happening, or else calls it an anomaly, then refuses to question the basics of QM cosmology. Consider a more ordinary example: We can misperceive something, yet trust that our inaccurate or incomplete observations and presumptions are valid, correct. Obviously, that problem causes many controversies, conflicts, false dichotomies, and bad or inadequate theory.



**Space:** Space is a word representing our perceptually derived experience or concept of explicate dimensionality (a subsidiary principle and property of form). So, “outer” space is neither nothingness nor outside anything.

Space is not a ‘4D’ continuum of empty geometry+time; and dimensions are nonphysical ideas or measurements. They exist only for and “in” minds, experiences, perceptions, illusions, and ideas (etc.). Space is also a virtual property of various actual and potential expressions and/or embodiments of dimensionality and locality (two of the properties and subsidiary principles of form, the metalogical principle). So, we see telescopic images seeming to support notions of ‘dark’ energy and ‘dark matter’ filling  $\pm 96\%$  of a mostly empty universe (the field of being between and within galaxies (and everything else)). Yet, even Higgsians now admit that ‘space’ is not empty. In fact, it is every place, everywhere, never outside of or apart from things, entities, energies, and meta-energy. We can rely on that because good astronomy shows that the 2 undetectable forms of energy (the transparent ‘dark’ kinds) interact with luminal forms of energy: plasmas (the light, slower kind), nebulas, and galaxies.

Yes, hyper-luminal energy’s frequencies are beyond technological detection and measure. So, to us, what seems dark and empty is simply invisible, transparent. That theorem is also supported by experiments with ‘synthetic’ ultra-heavy elemental nuclei. They can cause breakdown (perturbation, turbulent slowdown) of the vacuum (the hyper-energy field), causing precipitation of electron-positron pairs (etc.).\*

Laboratory experiments verified work that confirmed the existence of the indirectly detected field ( $MDE_{fo}$ ) of hyper-plasma ( $E_{PH}$ ), the hyper-luminal energy of being. Wikipedia’s article on the results of QED and SED helps:

“...both [quantum electrodynamics](#) (QED) and [stochastic electrodynamics](#) (SED)...with the principle of [Lorentz covariance](#) and with the magnitude of the [Planck constant](#) suggest a much larger value of  $10^{103}$  joules per cubic meter.<sup>[4][5]</sup> This huge discrepancy is known as the [cosmological constant problem](#).”

Early work in QM physics estimated the energy-density of the emptiest cubic centimeters of the universe at  $10^{80}$  or  $10^{100}$  greater than the energy density of the densest physical element. That is vastly greater density than  $10^{-9}$  Joules per  $m^3$  of seemingly empty space. Of course, that estimate was calculated without including Planck energy density and hyper-energy density (. So, clearly, no part of the field of being is empty or lacking energy sufficient for enabling all subsidiary, constituent phenomena, processes, and events.

Yet, more importantly, the findings of QED, SED, and radio-astronomy prove that our old notions about ordinary matter and reality were severely deficient, mostly defective. This post-modern theory and metatheory of macro-ontology and natural metalogic resolves obsolete SM deficiencies and the cosmological constant problem.

**Time:** The universe is a momentary event, always happening now. Time is a concept and an illusion enabled by our minds, perceptions, changes, and duration. Those experiential phenomena are enabled by the principles of actuality, activity, mentality, physicality, form, structure, functionality, and semiosis. So, time is not an independently real, universal actuality or thing that exists outside our minds. Thus, reifying (thingifying) time, while ignoring its illusory existence may make good scifi possible, but makes good physics impossible. Unreifying time by defining it as half (or 1/4) of an impossibly curvy, totally empty ‘space-time’ continuum was a bad idea.

For example, 'space' is a psychosocially derived construct enabled by principles and properties of form. Like time, perceived space is an illusory product of limited knowledge. So, combining illusory time and illusory space—to create an impossible fabric of curvaceous yet  $\pm 96\%$  empty cosmic geometry—is as foolish as it is confusing. Actually, the universe exists momentarily, as it always has, as a constantly changing event.

The very reliable principles of nature enables and sustains its constantly changing events, subevents, processes, living beings, and all other phenomena. Otherwise, it would all get stuck, stagnate, or else never be here and now in any definite, durable form.

So, the only necessary and sufficient continuum of universal reality is the continuum of being, energy, and the meta-energy of its enabling principles. Also, that makes the only real 'time travel' via either memory or dreaming, or as a mental field-effect of universal being (and its intelligence and infinite potential). We can be sure of that because being's totality is constantly changing every form of being and energy in its current moment of presence. Its intrinsic principles, properties, and interactions enable, cause, and limit the changes. In other words, the universe (and its ever-changing condition) and our consciousness are co-emergent phenomena (of being) happening in the only place and time that exists, here, now.

The past (a previous condition of universal being) always was and is being constantly transformed into being's current moment of presence. In other words, all former states, forms, conditions, and enabling processes of physical being no longer exist, because they enabled this moment of being and its current condition.

- \* In laboratory experiments, special equipment enabled researchers to create a super-heavy ion (artificial nucleus) of a transactinide (transuranic) element that they then inserted into a near perfect 'vacuum' (in an assembly containing a positron detector). That was thought to cause a destabilizing turbulence and "decay of the vacuum" (of the field) and "precipitation" of self-annihilating positron-electron pairs. The choice of wording was more appropriate than realized at the time. However, the result was an example of a quasi-Schwinger Effect enabled by the existence and nature of the hyper-luminal  $MDE^\infty$  field (of hyper-frequency hyper-plasma).

**Strange attractors:** Like 'dark' stuff, and other SM anomalies, the label "strange attractor" is a verbal landmark proving ignorance, misunderstanding, and deficient theory.

For example, some regions of the universal field 'look' dark and totally empty, being very far from all galaxies and galaxy clusters. Yet, some seem attractive, with very high temperatures. All that heat 'normally' indicates energetic activity and massive SM matter. However, SM physicists are as baffled by that anomaly as by the thousands of others that disprove their pseudo-theory.

Obviously, the only things that attract anything or anybody are pheromones and other signals for facilitating mating, hunting, and purchasing of products. That is so because all flow phenomena of the  $MDE^\infty$  field of energy and hyper-energy are best understood with terms that best describe the fluid dynamics and enabling fluid mechanical principles that make it all possible (and visible as fluidic phenomena). High 'pressure' regimes/regions are not attracted to lower pressure regions/regimes, because they are not separate, isolated things, events/processes. Fluidic flow phenomena are inseparable field-effects of the field and subfields of (interdependent)  $MDE^\infty$  energy and hyper-energy.

That is as true of magnetic flow and hydraulic processes as it is of the whole of the cosmic

field of being. So, the basic assumptions and interpretations of obsolete theory are simply invalid (thus, terminally deficient). The hyper-plasmonic modes of the field of energy and hyper-energy are constantly sustaining a responsive 'push' of co-emergent energy. That enables the detectable forms, modes, and effects of energy that are recycled back into the hyper-frequency modes of the circuit. (see defs., Energy & Matter)

However, in SM pop-sci media and mainstream literature, we see little or nothing about those apparently dark, colossal regions of intergalactic  $MDE^\infty$  field phenomena. Likewise, we now see little or no work on the huge cosmological constant problem, despite ever-increasing evidence provided by all the heliospheric, galactic, and extra-galactic phenomena discovered via new astronomy. So, doing real scientific work (mentally, empirically, theoretically, and experimentally) requires courageous exploration and investigation where no modern QM theorists dared to go: into the realm of post-modern science.

On the other hand, the recent Nobel prize for using maths to confirm the possibility of 'Black Holes' proves the degree of confusion and decline of the paradigm of modern science and society. Of course, there are CGI images of data that seem to show evidence of black holes in galactic cores. However, the associated data and images could just as well be seen and understood as a phenomenon in the center of axial galactic vortices.

Also, with fluid dynamics, a torodial or quasi-spheroidal cosmic vortex of a maturing 'strange attractor' can be equally easily understood as a [pre-galactic] embryonic nebula. (see defs., Galaxy & Black Hole) On the other hand, heat requires causes, interacting subfields, varying rates of flow, and the effects of turbulence (etc.). Obviously, the cosmos is the totality of such phenomena (and their energetic emanations). It may be possible that the spin of the whole cosmos interacts with the different rates of motion of its hyper-luminal and luminal subfields (another possible cause of seemingly strange cosmic heat).

**Axiom:** "Axiom" is a symbolic label sometimes applied to "laws" of nature or maths, or elements of formulas. Originally, to the Greeks, an axiom was a definition of a principle or statement about the nature of something that could be trusted as proven true, by long observation and experience, or with logic and/or by practical experiment.

In that sense, holonomic meta-axioms have constituents, real semiotic components that express natural principles. They make the symbols, thoughts, maths, functions, and operations possible. Yet, axioms of limited conventional theories have limited validity and potential. So, we have two kinds of axioms, 1) the provisional axioms of conventional logic, maths, and science; and 2) meta-axioms of valid metalogical metatheory.

**Theory:** Theory, the word, is intimately related to the concept of divinity and/or theology and gods (or, more recently, to God). Of course, the amazing Greeks of antiquity accepted and used notions of multiple gods (to deal with unknown facts of nature and being).

Naturally, since then, more modern 'Western' societies and their defeated competitors adopted and adapted to the dominant paradigm of science, society, etc. Yet, a theory is an aggregation of theorems composed of combinations of assumptions, notions, conceptions, and/or interpretations of data (either observed or deduced). They provide approximate descriptions, speculative hypotheses, and incomplete explanations of actual phenomena, processes, and events. Therefore, truly scientific theory may be upgraded and falsified.

So, anyone who rejects or seeks to prevent effective critiques or upgrades of existing theory

or SM hypotheses is defending unscientific falsehoods or nonsense, not legitimate scientific theory.

**Metatheory:** Unlike conventional scientific theories and assumptions, principles, and valid theorems of post-modern maths metatheory are not falsifiable. As in conventional metatheory, statements of the truths of a holonomic metatheory are proven within its own context, yet also by virtue of pre-existing natural principles. Those principles of natural metalogic are not just concepts or elements of axioms, theorems, or hypotheses. So, nature's principles and the meta-logical metatheory are unfalsifiable.

Naturally, while anomalies and disputability reveal the incompleteness or fallacy of a theory, absence and reduction of anomalies confirms the completeness and validity of a metatheory. Wikipedia gives these interpretations of the meaning of conventional metatheory:

*A metatheory is a theory whose subject matter is some other theory (a theory about a theory). Statements made in the metatheory [of a] theory are called **metatheorems**. A **metatheorem** is a true statement about a **formal system** expressed in a metalanguage. Unlike theorems proved within a given formal system, a metatheorem is proved within a **metatheory**, and may reference concepts that are present in the metatheory but not the **object theory**. (Wik 2020-08-24)*

For example, new paradigm maths metatheory is holonomic, describing and explaining the basic principles of enabling meta-logic, semiotics, maths, and numbers. Yet, they also enable thought, communication, practical activity, and being itself.

Ontologically, "metatheory" means the domain of discourse and body of knowledge pertaining to the principles and nature of being, forms, structures, functions, operations, and other phenomena. It underlies, supports, and functions beyond the scope of conventional systemic theory. Valid metamaths metatheory enables optimal theorems about actual and virtual phenomena, proof, objects of consciousness (principles, axioms, rules, numbers, geometries, algebras, systems, physics, and so on).

Therefore, the holonomic metatheory of science deals with the self-evident logical and metalogical principles and semiotics required. Understanding metatheory and maths evolves more easily by studying history. Related articles are helpful, especially the article on metalanguage, linked here: <https://en.wikipedia.org/wiki/Metalanguage>

**Number Theory:** It may not seem relevant to a holonomic ontological theory of atemporal primacy, but reconsidering number theory relates directly to the principles enabling all scientific work. For example, to be valid and viable, number theory must include the basics of numerical logic and semiotics. It must enable understanding of the nature and potential of numbers, individually, as symbols, and as both mental and semiotic phenomena.

In other words, the only valid, viable number theory is holonomic, a logically whole, self-consistent, and logically complete metatheory of numeric logic. Conventional number theory fails to explain why and how numbers are what they are. It ignores the basics, what numbers are, how, what they relate to, and why. So, modern number theory lacked a viable logical foundation of valid metatheorems (of numeric metalogic). It also suffered from the lack of a unitive paradigm of science and maths. A metatheory of numbers and numeric logic must include all the required basics.

Thus, holonomic number theory enables understanding of primal principles of numeric

logic, form, structure, functions, relations, semiotics, and the results. Based on the enabling metalogical principles of being, holonomic numeric metatheory is completely logical, self-consistent, and holotrophic (evolutionary, extensible). It includes the enabling principles of numeric logic. Thus, it fosters new theoretical work and greater understanding.

By integrating theory with enabling metatheorems, holonomic number theory is congruent with the actual metalogical principles of maths, next SM metamaths, and the holotrophic metatheory of logic and science. (see defs., Science & Proof Theory)

**Proof theory:** Modern proof theory was unfinished, incomplete, deficient, disputable, and suffered the lack of a completely defined metatheory of logic, maths, and proof. Thus, many important problems remained unsolved, some for centuries.

That lack of proofs partially proves the deficiencies of former proof theory. In fact, this project enabled realization of 2 mostly ignored elements of metamaths and optimum proof theory: satisfactory explainability and disputability.

Clearly, the greater the degree of a theorem's (or proof's) logical explainability (and intelligibility), the greater its success. Hence, the better the explainability, the more satisfaction, viability, and value provided.

Yet, where optimum explainability is lacking, the greater the degree of a theory's disputability, the greater the degree of its weakness and/or failure. Ontological proof theory is holonomic, based on holotrophic metamaths and its enabling metalogical principles.

The principles of meta-ontology's metatheory enable logical and metalogical proofs of maths, and of optimum proof theory. For example, this work uses the principles and methods of optimum proof that enabled explaining the reasons for the historic failure to prove the truth of **RH** (Riemann's hypothesis). Even with the most powerful "AI" computer systems available, **RH** was and is a hard NP-complete problem not solvable by economical computation in "P time" (polynomial time).

Another prime proof that  $P \neq NP$  is proven by the disputability, defects, incomplete definition, and deficient explainability of modern metamathematics (since Hilbert). Yet, holonomic proof theory enables logical confirmation of the possibility of resolving hard NP-complete problems computationally (in P time). Yet, that is possible only if the enabling logic, metatheory, and sufficient understanding (of enabling principles) are available. The results of this work verify that claim.

**Mathematics:** Mathematics (maths) is a a) field of logical thought, b) a symbolic descriptive language, c) a technical discipline, d) a practice, and e) a science. It is enabled by logical and metalogical principles of being form, structure, function, logical relativity, axiology, and operational semiotics.

Mathematical principles and phenomena are virtual, non-physical, logical, psychophysical, and semiotic. So, the properties of maths can make it descriptive, prescriptive, and generative. They also enable mathematical functions, concepts, systems, complex constructs, communication, interactive applications, operations, and results.

Originally, maths developed as a semiotic discipline that existed for the sake of gaining useful knowledge and wisdom, the understanding of reality. Though maths now seems mostly used for practical tasks and commercial applications, its original purpose survives and drives the development of new metatheory. For example, we can now see that principles of mathematical

logic are subsidiary expressions of enabling principles of morphic, structural, functional, and semiotic operational meta-logic. So, maths is a subordinate subdomain of metamaths.

**Metamathematics:** “Metamaths” is the metatheory and metalanguage of the intrinsic metalogical principles and logic enabling and governing maths. It is also the ontologically and socially focused study and philosophy of maths and its epistemics.

Wanting to confirm, expand, and extend the scope and potentials of maths and philosophy, David Hilbert initiated the modern approach to its ontology. However, he failed to provide a well-defined foundation of metatheory. So, his fragments of metatheory were and are insufficient for supporting better maths (etc.).

Holonomic metamaths deals with the actual nature and elemental principles of maths and the intrinsic metalogical principles that enable them. Holotrophic development of holonomic metamaths enables new theory and metatheory of maths, thus new uses, and new possibilities.

**Semiotics:** The logic and study of communication is called semiotics. Natural metalogical principles make linguistics (and its branches) subsidiary to semiotics.

Semiosis, communication, an integral principle and function of being and intelligence, is clearly a ubiquitous property of life. Cells, flowers, and most animals use chemo-semiosis. Some also use sonic semiosis for direct expression and interaction. Our languages are semiotic and mostly symbolic.

Maths and semiotics are inseparable, but semiosis is an expression of metalogical principles and properties existing independently of and prior to maths (and all other human languages). Hence, semiosis proves the existence of mentality, the principle, and mind. Semiotics also proves the trinity of mind, voice, and body.

Some physicists believe that information is a primordial constituent of universal reality, intrinsic to all forms and structures, yet without minds and communicators; and without any explanation of how information can exist without mentality, receptivity, transmissivity, and other natural principles of being. Information is an object of consciousness, composed of our ideas, illusions, assumptions, opinions, and facts. So, without intelligence, semiosis (sentient communication), and transmitting and receiving entities, information would be impossible.

The linguistic nature and functionality of maths exist in interdependent relativity with its intrinsic principles and semiotic expressions. The symbolic sublanguages of maths and mathematical logic are perfect examples of logical semiotic code, enabled by the extensible systemic domain of overt operational logic.

**Semantics:** The philosophy and unfinished definitions and metatheorems of modern maths were limited by deficient a) philology, b) linguistics, and c) semantics. Semantics give the dialects of languages their currently accepted meanings and connotations.

As in all human languages, the semantics of science and mathematical linguistics and semiotics are equally definitive. Likewise, they deserve and need evolutionary revision, better theory, and better metalanguage of the governing metatheory. Hence, semantics is a critical element of post-modern science, metamaths, and proof.

Unfortunately, generally accepted theories, assumptions, and beliefs of groups of users of languages determine the scope, content, and intentions implicit in their languages and their semantics. So, societies’ different languages tend to limit ‘subversive’ communication with

inherently dynamic conservatism. Groups of mathematicians of the various subdisciplines are no less subject to currently accepted norms of their current paradigms.

Only when a group's fundamental paradigm, its standard model (SM) of 'reality' is revised does its language change or evolve. Otherwise, a group's semantics reinforces and limits the scope of its inherent philosophy, its paradigm, its current *understanding* of reality, and the thoughts that are normally thinkable. Hence, Neils Bohr thought that major scientific revolutions happen when the last of a paradigm's Old Guard defenders are buried.

Until then, new theory and meanings, and radical new philosophy normally generate negative reactions, overt and covert hostility, and derision, or worse. Exceptions to Bohr's theorem of scientific revolution are vastly outnumbered by the historic proofs.

**Epistemics:** Macro-ontological epistemics is the holistic study and knowledge of the modes and mechanics of knowing, meaning, connotation, interpretation, implication, reasoning, and the nature of knowledge.

Of course, mastering all that requires extraordinary knowledge of anthropology, sociology, philology, semiotics, linguistics, semantics, world history, literature, and philosophy. Yet, the sociocultural paradigm of modern SM science and maths failed to foster and support adequate study of the basics of holistic epistemics. Thus, limited by psychosocially enforced deficiencies, the domains of discourse, theory, and metatheory of modern science and maths were retarded.

Optimal science and metatheory require optimum phenomenology, ontology, semiotics, and epistemics. Unfortunately, any group's semantics are enculturated psychosocial constructs. So, without effective epistemics there can be no optimal semiotics or semantics, no effective communication and, so, no optimal proofs, no optimum theory or metatheory (of science and maths).

**Symbol:** A symbol is an object of consciousness, a virtual conceptual construct that may be expressed or embodied as a semiotic object of perception and cognition. So, though a symbol may be a purely mental object of consciousness, it can be expressed with an actual physical or graphical object or image, or sounds, names.

For example, numbers can be represented by spoken or written symbols, or depicted or embodied somehow. They can encode representations of values, quantities, entities, or anything else. So, essentially, a symbol is a semiotic device existing for the sake of communication, but with no actual or logical existence separate from or apart from the meaning it represents. Nor do symbols exist apart from the consciousness of a perceiver or conceiver and communicators.

**Zero:** When we think of the nature of a womb, then 0, the numeric symbol of absence or nothingness and nonbeing is a perfect symbol of the neutral origin of all numeric forms. Zero—always relative to something that exists (universal totality, etc.)—also symbolizes both negative potential, pure neutrality, virtual and ordinal absence.

Zero (0), a numeric primitive (symbol of absence), is a uniquely singular, logical reality and label. So, 0 deserves the unique distinction of being the one and only virtual expression of original and neutral primality. Of all integers, only 0 best expresses the numeric origin of both sides of the number line, and the central point of coordinate mapping graphs. There, only 0 has no actual presence, nor any positive or negative identity. That confirms its proto-primality and singular logical nature.

In fact, unlike the mathematical objects commonly believed to be ‘black holes’ in ‘dark’ stuff (called ‘space’ or curved “space-time”), 0 is the purest, truly naked singularity, hidden in plain sight. On the other hand, consider 1, a symbol of singularity. It can also represent positivity (or truth), unity, individuality, identity, presence, and original wholeness. Still, what is originally or persistently nonexistent or yet to exist is always currently unknowable but, logically, the presence of anything implies and requires absence, even the absence of nothingness.

So, in principle, zero represents the logical relativity of nonexistence and the presence intrinsic to universal being. So, without 0 (zero), no  $0 + 1$ , then no 1; and no 1, then no  $\mathbf{N}_S \rightarrow \infty$  (no numbers, no maths, no measurements, and no science).

**One:** “One” and 1 are not simply numeric concepts and symbols. Natural oneness was originally all-inclusive, and preceded the mathematical expression of it. Thus, a single identity or form (of some kind of thing or being)—or the unity of a vast set of truly identical things or entities—is and was always itself, not another unit of some other kind.

A natural form of being, whether actual or virtual, is present and knowable because of its unique identity, its singular embodiment and/or expression of the actuality and integrity of its individuality. Yet, in principle, the original, universal one-ness of all things and beings is enabled and sustained by its primal primacy and its primary priority. That may seem paradoxical, unless we recall that all things and beings are subfields of the field of being, enabled by its energy and nature, its intrinsic enabling principles.

So, consider the pervasive expressions and instances of oneness, singularity, individuality, identity, unity, and uniqueness (including the cosmos itself, and each new moment of its presence). Now, the elements of the pre-existent field of phenomena (the events of life’s present moment) were and still are all logical and/or metalogical in nature. So, each part of any composite thing is an expression of its own singularity. Thus, the primary ordinality of 1 implies its priority and its unique expression of elemental wholeness, the completeness of being’s unity, and its cosmic integrity.

So, 1 deserves priority as the primary numeric expression of positive primality. The best definition of primal numbers (with values greater than 5) proves the prime primacy of 1:

Primal values of  $n \subseteq \mathbf{N}_P \supset p_x = n$  if its only factors are  $p_x$  and 1.

Translation: All primal numeric values are a subset of or equivalent to  $\mathbf{N}_P$  the superset of all  $p_x$  (primal numbers). So, if a number has only 2 factors ( $p_x$  and 1, divisible only by its own value and 1), then it is a member of the primal superset.

Of course, showing that any primal  $p_x$  is not a multiple of any preceding whole number sum of  $n + 1$  validates that definition. Also, like any other primal number’s value,  $p_x$  can represent the value of 1. So, clearly, that logically superior definition conforms to the subverted definition (where  $n_x = p_x$  if its only factors are  $p_x$  and 1). Further, because both nothingness and duality are relative logical complements of unity, the nature of 1 implies both 1 and 0, and 1 and 2. Then, 0,



1, and 2 enable and imply 3, which symbolizes the primary set of all manifestations of triality, and of  $1 + 1 + 1$  and all relativities of  $0 + 1 + 2$ , all depending on the logical primality of 1.

Obviously, we can see that 1 of anything is not anything else; also that singular phenomena existed before humans and maths. So, the natural primality of 1ness preceded its existence as an element of maths. Its numeric value and priority are virtual yet, as a transfinite expression of formal semiotic potential, 1 is inseparably related to cosmic unity-as-a-whole (and all phenomena within it, including its own primal integrity).

**Two:** Primal duality enables and relates to two (2), the number and its graphic symbols. Like all other numbers, 2 does not exist in any nondependent way, separate or apart from the other numbers, numeric logic, natural realities, entities, quantities, and values to which it relates.

As the first post-unity primal number, the primitive primality of 2 can be seen in its direct relationship with 1 and 3, with no derivative nonprimal numbers intervening. The number 2 is also the first primitive primal that can symbolize the existence of something other than the singular totality of natural unity.

All psychophysical instances of duality, dyadic primality, nondual relativity, and polarity are embodiments and/or expressions of the generative principles governing the nature of being and explicate actuality. Hence, the complementary relativity of 0 & 1 (or nothing + something) makes them primal expressions of dyadic unity, 2ness. The numeric logic of 2 is a consequence of the generative, morphic, structural, and functional principles that make it as universally potent, primal, and important as 0 and 1.

**Three:** The first primitive primal number representing the existence of something other than unity, duality, and dyadic primality is 3, the symbol of triality and triadic phenomena. All psychophysical instances of triality, triadic primality, and their relativity are all embodiments and/or expressions of the primal nondyadic (triadic) symmetry (enabled by nature's metalogical principles of being) and its intrinsic, explicate multiplicity.

The numeric reality of 3 is virtual. As with all other numbers, 3 and 3ness do not exist in a nondependent way, separate or apart from the natural principles, entities, quantities and values they enable and/or represent. The relativities of 0 and 1 and 2 and of 1 and 2 and 3, used as groups or sets, make them expressions of triadic primality. As the first post-dyadic primal, with no nonprimal sums or products preceding, the primitive primality of 3 can be seen in its direct relationship to 0 and 1 and 2.

As a trinity or triadic set, the first 3 primitive integers are each a virtual negation of 3 (each signifying an absence of explicate 3ness). Yet, 3 is the result and cardinal value of the set. So, the triadic primality of 3, and its status as the first nondyadic (odd) number other than 1, is an integral expression of positive primitive primality and the relationship of 0 and 1 and 2.

The absence of an intervening whole number between 2 and 3 is an expression of the primitive primality of the primal numeric triad and the principles of triality and trinity. Clearly, the nature of triality (triadic primality) enables and expresses the actualities and potentials of complex multiplicity and all geometric phenomena. Thus, forms, structures, values, numbers, and quantities (greater than or beyond 2) are enabled by 3.

For example, we may find that cellular intelligence can use many levels of high-bandwidth EM communication code, but RNA uses a trinary chemo-semiotic code to produce our proteins, enzymes, and nucleotides. That trinary code also enables and maintains the quadrinary DNA

code informing and sustaining us and countless other species. Of course, trinary code also enables and sustains the much more numerous forms of viroids and virions on and in the Earth and its oceans.

**Virtual numbers:** Calling some values and numbers “imaginary” or “transcendental” or “real” or “rational” or “irrational” or “infinite” is confusing. All numbers are conceptual. They may exist as products of realization or of imagination and/or visualization. They can appear as conceptual symbols, via intuition and/or memory.

However, numbers and symbols are infinite, yet definite, and some can more usefully be called or considered virtual numbers or values. For example, in the domain of maths, the value of  $i$ , the value that, when squared, equals  $-1$ , is called imaginary, but it is clearly not. It is also no more abstract than any other numeric or symbolic abstraction.

In fact, in the obsolete context of antique maths,  $i$  once seemed an absurd impossibility. Yet, the useful potential of  $i$  and other exotic symbols of virtual values make them everyday necessities of technology, business organizations, cultural institutions, and modern science.

Such virtual values, numbers, and phenomena exist because the metalogical principles of being enable the totality of this universal moment (of life). Yet, bear in mind that being and life never make circles with “transcendental” ratios and fractions. What we call “ $\pi$ ” (or pi) is simply a symbolic referent, an inexact approximation, a numeric concept, and a rationalized label that transcends nothing but nonbeing. Still, obviously, all numbers, numeric values, and ratios are virtual phenomena.

**Intrinsic numbers:** Numbers themselves (not the semiotic symbols we use) are virtual objects of conscious realization or intuition, and of communication. Yet, some numbers—classified as irrational or transcendental or imaginary or real—closely approximate or relate to various natural or mathematical phenomena. We therefore know of formulas, equations, expressions, ratios, and constants useful in physics, engineering, astronomy, and so on.

For example, the ratio called pi ( $\pi$ ) is intrinsic to the geometrical construct we call the circle, among other things. So,  $\pi$  is intrinsic to our system for measuring what we call “the passing of time” (etc.) and for mapping Earth’s geography. Yet, if geometers in ancient Mesopotamia based their number system on anything other than the number of bones in their fingers and toes, then hours, minutes, and circles might not relate so intimately with 60 and 360; and trigonometry might be very different, if not nonexistent.

Anyway, the fractional ratio of the circle’s circumference divided by its diameter is close to perfect, but still not exact. Still, no perfect circles outside of purely conceptual geometry, but geometry is a natural product of human mentality, a natural reality (in principle, at least). So, it is somewhat confusing to call a logical ratio an irrational or transcendental number. We may as well call them either virtual or intrinsic numbers.

All numbers, terms, and expressions of maths are essentially virtual and actually intrinsic to the paradigm of maths, which exists only in human minds. Hence, numbers, symbols and expressions relating to natural and virtual phenomena relevant to the paradigm of what was named “continuous maths” could be called natural, but so are numbers representing discreet phenomena, like 2 babies.

To minimize confusion while supporting clarity, instead of calling them natural, or rational, or irrational, or imaginary, or real, or transcendental, we could call them all special or virtual, if

they relate only to virtual phenomena; and, if they relate directly or are integral to descriptions of natural and/or discreet phenomena, we can think of them as intrinsic numbers. For example, we can consider the Golden Ratio,  $\Phi$ , phi (pronounced like fee), and similar objects of maths as symbols of naturally intrinsic numbers or ratios or constants.

Phi, an ideal example, has the virtue of being intrinsic to pentagrams, pentagons, and other objects of geometry, trigonometry, and the Fibonacci sequence (etc.). It also closely approximates many observable natural forms and patterns. So, like pi, phi could be considered and called intrinsic, virtually and actually. Then, if the language of maths became much easier to understand, explain, and remember, even ordinary children might enjoy thinking and talking about numbers and maths. After all, maths is a language. So, with more logical names and terms, teaching and doing maths, science, and engineering may be more effective.

**Primals:** Primality is a principle that exists within and far beyond maths. Calling natural whole numbers divisible only by their own value and 1 “prime” is overly simplistic and confusing. Primal numbers  $N_p$  (or  $p_n$  or  $n_p$ ) are those positive naturally whole numbers that express the primal integrity of unique numeric identity, individuality, and unity.

The most primitive numeric expressions of positive primality are symbolized by 1 and 2 and 3. Yet, uniquely, 0 expresses neutral numeric primality. For example:

$$0 \div 0 = 0 \text{ and } 0 \times 0 = 0 \text{ and } 0 + 0 = 0 \text{ and } 0 - 0 = 0$$

None of the results of those equations are either positive or negative, because the logical negativity of 0 is neutral. That makes 0 a uniquely singular expression of primal integrity and nonbeing (nothingness). So, together, nonbeing and its primary logical complement, unity (or 1), express the primality of 2 (the numeric symbol of primal duality). Original primality and unity are expressed by the complementary nonduality of action and stasis, change and constancy, form and formlessness, or truth and falsehood (reality and unreality). So, we can use 1 and 0 to symbolize all primordial existential couplets or any other dyadic phenomenon.

The numeric primality of 2 also reflects actual duality in unity expressed in DNA-RNA, cell division, sex, birth, and all the other relative polarities of being, including that of presence and awareness, body, and mind. Clearly, all subject-object phenomena express dyadic primal relativity of identity and duality (or infinity).

The nondual ‘self-other’ relation, simply symbolized with 2, also represents the logical nonduality of symmetry and asymmetry, simplicity and complexity, singularity and multiplicity, unity and totality. Other than 0, 1, 2, and 3 are the primals most expressive of purely primitive, numeric primality.

That can be realized after recognizing the nature of triadic primality as a potential of the nature and presence of duality and dyadic primality. The primary expression of diversity and multiplicity is symbolized by 2. Yet, where there are 2 objects or events, in principle, there must also be 3, virtually, at least by logical implication. For example, the primary expression of complexity is intrinsic to 3, which we can see in the presence and relationship of 0 and 1 and 2, and all other expressions of predominant triality, trinity, and triadic primality.

The primal presence, logic, and effects of 2ness and duality infuse and inform the logical backbone and results of numbers. Thus, duality and triality are intrinsic to the primal pairs (‘twin primes’). So, all primals greater than 5 (in progression  $n + 1, n_a + 1, n_b + 1, \dots \rightarrow \infty$ ) come before and/or after  $6n$  (a multiple of 6). So, here is the best definition of primals ( $n_p > 5$ ):

Primals are the only whole numbers ( $n$ ) not multiples of any other value of  $n$ ; and, with  $n_p > 5$ , products of  $1 \times n_p = 5n + 1$  or  $6n + 1$ . The set theoretic definition is:  $\exists n_p > 5 \in \{\mathbf{N}_p\} \supset p_x = 6n \pm 1$ , if the only factors of  $n_p$  are  $p_x$  and 1.

**Composite numbers:** All whole numbers can be composed by addition of numbers of lesser value or, at the least, by adding 1 to a number. However, the oddly named ‘composites’ ( $C_n$  or  $n_c$ ) express numeric nonprimality and complexity. They can symbolize all composite phenomena of logical relativity.

Set theoretically, the nonprimal whole numbers are defined as  $\{C_n\} \supset n_c \neq x \equiv x \times 1$ . That means that a nonprimal number does not equal any number strictly identical (only equal) to a result (a product) of its own value multiplied by the value of 1 (unity). However, bear in mind that a whole number is a numeric unit of unity’s totality, the wholeness of being, reality.

So, all the relations, functions, processes, entities, identities, and activities of all domains and levels of being can be symbolized and related to nonprimal numbers with appropriate attributes, forms, structure, functional potentials, and properties. That is so because all phenomena are both unique and relatively dependent upon something else. Essentially, the cosmos-as-a-whole (AKA being), is the original, perfectly prime phenomenon. Hence, the nonprimals can express formal and structural symmetries and complementary logical polarities and relations relative to the logically relative asymmetry of unity and duality.

So, if we could keep adding 1 to each  $n > 3$  forever, an infinity of  $n_c \rightarrow \infty$  will display increasing intrinsic and extrinsic complexity, symmetry, complementarity, and divisibility, all increasing proportionally. For analyzing numbers, number theory, numeric metatheory, or  $Rf_z$  and  $\mathbf{RH}$ , investigating and understanding the natural nonprimal numbers is critically essential.

After all, without composite non-primality, numeric primality and primal numbers would be impossible. So, nonprimal numeric logic is as essential to fundamental metamaths as the primal numbers. Ramanujan’s works, among others, prove that truth.

**Phi:** The ancient Greek letter “ $\Phi$ ” (Phi, pronounced “fee”)—the essential key of the metamaths of Pythagorus and Plato—can be understood as the origin of modern number theory and post-modern metamaths.

The Golden Mean, Golden Ratio (or Golden Section), and the Golden Spiral generated with  $\Phi$  closely mimic the structural logic of nautilus shells (etc.). Made famous by Fibonacci and his famous series,  $\Phi$  is the ratio of 1 to  $\Phi$  and it to  $\Phi^2$  and  $\Phi^3$  ( $4.236067977499\dots = 1/\Phi^{-3}$ ). The logical congruency of  $\Phi$ ’s unique expressions of numeric logic, nature’s formal-structural dynamics (and the solar system,  $H_2O$ , DNA, etc.) verifies the enabling metalogical principles of being.

For instance, imagine the wholeness of cosmic unity as a line or time-line. Now, we can divide it into 2 unequal segments so the larger segment = 1 and the smaller segment = 0.618033988...( $\varphi$ , “phi”). If we then subdivide one of those segments in the same way, we can describe the relations of those segments as  $\Phi$  to 1, or as 1 to  $\varphi$ , where the larger segment = 1 and the smaller segment = 0.618033988...(notice the expression of fractality, the principle of self-similarity enabled by relativity, symmetry, integrity, reciprocity, identity, etc.).

That metatheorem is supported by the nature of  $\Phi$  and the qualities and logical properties unique only to it (among the infinity of other numbers and ratios). For example, the actual triangular form of  $H_2O$  (at rest state) is identical to the triangle formed by joining any 3 adjacent vertices at the perimeter of a pentagon (or very nearly so). Those angular relations are ruled by

$\Phi$  and  $\varphi$ . However, naturally,  $H_2O$  always bonds with at least one other mate, coupling strongly. That form and structure appears to explain the amazingly fluid integrity and qualities of water. It is now known that the double helical strands of DNA's atoms spiral around their central vortex (re:  $\pi D$ ) with a twist of  $36^\circ$  (forming a double pentagonal, decagonal cross-section). Now, recall that DNA floats or swims in a broth, simmering in all the frequencies of our cells' subfields, within our bodily subfield, in the Earthly and Solar subfields of the cosmos. Also recall that, the sub-elemental level of energy, form, structure, and functioning enables, empowers, sustains, and affects all the levels, forms, and modes of being. Even if ambient conditions (turbulence, etc.) make the angles and values differ a little (from Golden Ratio), the nature of  $\Phi:1$  and its natural relativity remain essential and durable.

Detailing all the many amazing correspondences of  $\Phi$  and the morphic relational dynamics of the solar system (and the rest of being's nature) would be too lengthy for this explanatory definition. Yet, recalling the numeric logic helps. For example, summing the values and results of operations with the powers and reciprocals of  $\Phi$  and  $\varphi$  demonstrate the *a priori* nature of numeric logic and the natural principles enabling it. The fact that the numeric value of  $\Phi^n$  is logically equivalent to  $1/\Phi^{-n}$  verifies the basis of holonomic number theory, trigonometry, reciprocity, relativity, integrity, identity, and equality.

$\Phi$ 's unique identity and qualities also makes it, in principle, validate the functional logic of maths in general, its enabling principles, and the primal metalogical principles of being (its nature). So, the nature of the ratio we label with  $\Phi$  makes it an incommensurable, irreducible, incontrovertible expression of nature's creative, morphic, structural, and functional principles.

**Addition:** An additive operation combines units or quantities or numeric symbols without multiplication or exponential expansion. So, adding 1 thing and another gives a sum of 2, a new quantity or thing. So,  $1 + 1 + n$  things produce an aggregate of 2 things plus the amount or quantity symbolized by  $n$ , for a new aggregate sum.

Addition may also involve symbols of fractional values and/or complex quantities that include quotients of implicate division and/or products of multiplication and exponential expansion. Addition requires only the summing or combination (or aggregation) of units or components of a composite thing or set, or of a group or series. An important exception to the above is the addition of a sperm to an egg, when the combination of their half strands of DNA, become a new example of oneness, unity, and singular identity, a new being.

Yet, that potent exception also proves the primordial interdependence and inseparable primalities of unity and duality (see the definitions of unity, duality, 1 and 2, below).

**Nöetic:** Mental and virtual phenomena and conceptual constructs are nöetic, nonphysical yet actual phenomena. The principles of maths and natural metalogic are the subtlest and most potent constituents of the nöosphere. The realm of mentality, metalogic, and cognitive phenomena contains and enables all subsidiary domains of logic, concepts, and discourse.

So, some mental phenomena and conceptions of maths and metamaths are less subtle and mostly less potent than elemental principles of nöetic meta-logic. From the perspective of natural logic, the nöetic, semiotic, and somatic orders of reality exist in dynamic dyadic and triadic relationship, subsets of the macrocosmic nature of being. For example, nöetic, semiotic, and somatic principles enable the potentials of the principles and properties of mental, vocal/verbal, and biophysical actualities of being. Thus, we can intuit or realize and/or see the

intrinsic ultra-virtual, virtual, and extrinsic forms and orders of being, logic, and interaction.

In other words, physical embodiments, actual and virtual expressions of being are integral, interdependent, interactive aspects of universal intelligence. Hence, natural nōetic principles enable science, maths, and metamaths, enabling and verifying their existence.

**Neophobia:** All chronic or recurrent irrational fears are phobias. The most irrational phobia is chronic fear of the new, because each moment of being is new. As most of us know, with the tiniest fractions of duration we can call moments, all physical things and beings constantly change. All its ever-changing things and events change the whole universe and everything in its vast yet momentary presence.

Each moment, however brief, all things and events exist in a new form and way, whether we realize that or not. Yet, scientists and mathematicians are human animals, most less than perfectly rational, at best. Therefore, most resist new ideas and theories that seem to threaten their conceptions of reality, normality, and acceptability.

**Xenophobia:** Chronic irrational fear of the alien (or the strange) usually occurs in combination with neophobia. The more different or unusual or unexpected something seems, the more alien and frightening it seems to xenophobiacs. So, the disorder involves irrational fear and loathing of the new, the unknown, and the unknowable. Xenophobia is a major hindrance, impeding and/or preventing the evolution of science, maths, society, and civilization.

**MacDonaldization:** The pandemic commodification of everything ensured by the forces of consumerist commodification of everything, maintained by pervasive neurolinguistic programming (via normalized mass-deception AKA education & advertising) enforces increasingly competitive commercialization of science and technological R&D. That led to systematic subversion and siloization of specialists. So, calling it “MacDonaldization” of education came to seem increasingly appropriate.

### 1.3 The Domain

“The logic of the world is prior to all truth and falsehood.” – Wittgenstein

Wittgenstein clearly understood that nature’s logic preceded our artificial logics. The “world” he referred to could be the universe that existed before us, or our thinking and talking about it, or a psychosocial notion (inherited from ancestors).

Regardless, both logic and its enabling metalogical principles existed long before the domain of discourse enabling and encompassing geometry, maths, theorems, hypotheses, conjectures, and proofs.

So, now, why the confusion about **RH** was not resolved by Wittgenstein or Hilbert or Gödel (or by earlier investigators) may not be completely knowable. Yet, sufficient consideration, insight, logical inference, deduction, and critical analysis provide abundant circumstantial evidence. It incriminates the sociocultural paradigm of their world. For, clearly, only the thoughts thinkable within the context of a sociocultural paradigm (the dominant model of ‘accepted’ reality) are socially acceptable and normally thinkable.

The holds true for subsidiary domains of discourse (and thought). That makes discovery, recognizability, provability, and explainability of new theorems difficult, at best, unlikely or impossible at worst.

Of course, the new ways of thinking and talking were unknown to Riemann, Wittgenstein, Hilbert, and previous researchers interested in **RH** or in metamaths. However, we can now talk and think about the logic infrastructure of natural reality and maths that Wittgenstein intuited. So, we can also consider and discuss the basics of the domain and the causes of the uncertainty that haunted **RH**.

For example, proof and thinking about **RH** belong to domains of discourse previously divided into the arenas of history, anthropology, sociology, psychology, ontology, logic, semiotics & linguistics, and the philosophy of science and maths (metamaths). However, we can now consider all those subdomains as subsidiary to holontology (the integral meta-ontology and macro-ontology of being, the whole of reality). Naturally, unveiling the mass-obscuration, neophobia, xenophobia, and factionalism maintained by academic silos and divisive confusion requires updating of the semiotic and linguistic elements of the macro-domain of science.

Redefinition, better definitions, and better terminology seem best served by new maths, to support elimination or minimization of confusion, anomaly, dualism, excess dichotomy, and regressive psychosocial conservatism. So, though the new and redefined terms provided here (above) may not be generally considered the best possible, they serve as a basis of further consideration, discussion, and development.

The following sections support the new semantics and semiotics of the upgraded, expanded domain of discourse essential for new paradigm logic, maths, and science. Yet, again, the intent is to initiate further development and discussion of **RH**, **GC**, **CC**, the **TPC**, **P/NP**, number theory and metamaths—to foster optimum realization of new possibilities.

## 1.6 Acknowledgements

“Excellence is never an accident. It is always the result of high intention, sincere effort, and intelligent execution, it expresses the wisest choice of many alternatives. Choice, not chance, determines your destiny.” – Aristotle

“Character may almost be called the most effective means of persuasion.” – Aristotle

“Criticism is something we can avoid easily by saying, doing, and being nothing.” – Aristotle

Despite those excellent truths, Aristotle is not my favorite ancient philosopher. In his text on *Rhetoric*, he admitted thinking his listeners were ignorant fools. My favorite philosopher (and favorite mentor) is the Buddha, the greatest ontologist and phenomenologist of all time.

Leonardo da Vinci deserves infinite gratitude and appreciation for his inspiring devotion to excellence and interdisciplinary research. The insights of and works of Michael Faraday, Buckminster Fuller, Paolo Soleri, many great scientists, IT logic designers, and several inventors were also inspiring and helpful. My deep respect and gratitude for the pioneers of geometry, mathematics, and logic is immeasurable. Yet—other than Euclid, Pythagorus, Archimedes, Fibonacci, Goldbach, Euler, Cauchy, Farey, Frege, Chebyshev and Riemann (among other

pioneers)—few deserve as much respect and gratitude as Friedrich Nietzsche, Ludwig Wittgenstein, Bertrand Russell, Alfred N. Whitehead, Georg Cantor, Kurt Gödel, Alonzo Church, Lothar Collatz, David Hilbert, and Alfred Tarski.

Ernest Nagel, James R. Newman, and Douglas Hofstadter deserve appreciation and gratitude for their excellent work reporting on and explaining Gödel's Proof (of **GIT**). I am almost equally grateful of John Derbyshire for his excellent book on **RH** and its context. He enabled much easier understanding of the key issues necessary for the best solution and explanation.

Similarly, my hat's off to Carl Erickson for graphing the structural logic of Riemann's zeta function (at  $+1/2$ ) and, despite not realizing how well it supports unconditional metalogical proof. He also did a great job of explaining how his elegant map (of symbolic zeros) does what it does, leading to important new insights. I am also grateful to several other investigators for important work on the **TPC**, **GC**, and **RH** (who posted partial and/or graphic or conceptual proofs, online).

I'm grateful for the late Aleister Crowley's uniquely provocative, weirdly fascinating paper, entitled "777" (a brief ontology of numbers, symbols, semiotics, infinity, and cognition). It was profoundly inspiring and motivating.

More than a few teachers were great exceptions to Aristotle's negative opinion of our fellow humans. I am especially grateful for the art teachers who showed me (from age 4 and on) how to see what was around and beyond the form of an object, instead of focusing only on objects. That changed my mind and helped enable my results and completion of this paper. However, most of my thanks are due my late father, for the inspiration, opportunities, and training he provided; and for my dear, departed maternal grandmother, for the inspiration, opportunities, love of science, culture, the arts, and the early training she enabled and supported.

Thanks to the love, inspiration, talents, help, and support of family and countless friends, this work became possible, necessary, and irresistible. Also, without them, I would have lost hope and given up long ago.

## 2. Results

### 2.1. Proofs & Metatheory

"I have tried to avoid long numerical computations, thereby following Riemann's postulate that proofs should be given through ideas and not voluminous computations." – David Hilbert

Despite the openly published intuitions of famous mathematicians—about proof requiring a new and deeper view of the structural logic of maths—chronic failure to keep questioning its foundation of enabling principles made success impossible.

These results prove that **RH** is true because all  $n$  in  $\mathbf{N}$  and of  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$  and all functional results in  $\mathbf{C}_{\infty}$  (and all their relationships) are naturally, morphologically, structurally, functionally, and constantly reliable. Clearly, as long as the nature of primality, symmetry, reciprocity, oneness,



twoness, halfness, and their potentials remain constant, **RH** is true. The following sections provide comprehensive proof and definitive explanation of that claim.

Now, please bear in mind that, before finding Hilbert's quote, Riemann's postulate guided the evolution of this project. So, early in the research, the appropriate strategy became self-evident. Yet, the nature and complexity of the problem meant that presenting the solution required a complex critique of all the erroneous assumptions and failed stratagems confusing the issues. So, some numerical, computationally verified evidence is presented here, but only to support the logical integrity of the solution, proofs, and explanation.

This introduction to the results deals only with some of the most critical issues and elements of logical proof of **RH**. However, it answers the questions Riemann and previous investigators failed to ask. That evaporated the fog of confusion and illogical objections, irrelevant rhetoric, specious reasoning, and logical fallacies.

For example, mathematical constructs and functions require operators of operations. However, successors, operators, and operations are clearly possible only because of pre-existing principles that generate or enable and sustain their functioning. Thus, anyone (famous or not) thinking a successor operation is a fundamental element of arithmetic misunderstands the nature of the principles and potentials of being, form, structure, function, relativity, semiotics, mathematics (maths), and its paradigm (the metatheory of metamaths).

Now, consider the perfectly logical constructible world theorem (**CWT**), where (in this actual universe)  $P \rightarrow \diamond P$  confirms the necessary and sufficient principles of being. Apparently, either the **CWT** seem too unsophisticated and insufficiently complicated or—like the nature of  $\mathfrak{R}_z$  and the principle of permanence (**POP**)—it remains unknown to most mathematicians. Yet, the **CWT** and **POP** enable all of maths, its paradigm (metamaths), and  $\mathfrak{R}_z$  (confirming the enabling principles, proof, and verification).

Of course, previous investigators were not simply too stupid or too lazy to complete sufficient research on **RH** and metamaths. However, if they had also been diligent philosophers and philologists, one might have proven **RH**—long ago—possibly ending their antique paradigm. Indeed, perfect proof of **RH**, **GC** (even numbers being composites of 2 primes), **TPC**, and the **P/NP** problem proves Einstein's notions about the nature of maths and reality illogical (etc.). It also proves Gödel right about the limits of derivative systems of axiomatic logic. Yet, proof is in the pudding (AKA our brains).

Unfortunately, paradigms resist change by being sticky, like neurolinguistic, psychosocial glue or phlegm. It makes providing generally acceptable proof and truly satisfying explanation of new paradigm results very difficult. That complicates the project. For example, understanding **RH** and  $\mathfrak{R}_z$  requires a nearly nonexistent understanding of the nature of intrinsic principles that enable numbers, geometry, maths, and nature.

Lacking that understanding prevents understanding of the logical symmetry and asymmetry that rule numbers and  $\mathfrak{R}_\zeta$  (and the metalogical principles enabling its operation and results). For perspective, consider this:

In *Riemann's Zeta Function*,<sup>[2]</sup> E.M. Edwards noted Riemann's appreciation of the geometric potentials and symmetries of his formula. Edwards said that Riemann favored its elegance expressed with calculus more than with the algebraic form (and its infinite sum of complex reciprocals). Yet, Edwards and Riemann looked no deeper than the conceptual and semiotic layers of mathematical beauty.

This multi-level proof reveals the underlying numeric logic, the morphology, and the natural metalogical principles enabling  $\mathfrak{R}_\zeta$  and **RH**. It also explains the functionality of  $\mathfrak{R}_\zeta$  (its intrinsic properties, operative functions, etc.) and the semiotic logic previously ignored. Again, the central issues called for the extension of metamaths with remedial metatheorems required for optimum explanation, understanding, and proof. So, critiquing the failed approaches was and is an integral necessity. For example, all theorems and proofs, laws, rules, and axioms are conceptual constructs that express certain principles, concepts, or beliefs, or insights and realizations. They may be either partially or completely true.

So, clearly, the more congruent with nature's actuality—its essential principles, properties, possibilities, and potentials—the better the theory (its concepts, terms, constructs, axioms, and rules). Yet, axioms only state partially observed, partially understood phenomena. Our theories, systems, rules, and theoretical 'laws' are only as good as the axioms, beliefs, and assumptions that support them.

On the other hand, this multi-level meta-ontological proof of **RH** relies on natural, universal realities. They are falsifiable only by invalid illogic. Also, as will be shown in the following sections, this proof, the new theory, and new metatheory are supported by Euclid's proof of the infinity of primals, and by absolute proof of **GC**, **CC**, the **TPC**, and by graphic proof of easy, precise location of all primals  $p_n$  (in  $\mathbf{N} \rightarrow \infty$ ). Of course, computational verification of an ultra-colossal number of zeros of  $\mathfrak{R}_\zeta$  (on the line of symmetry, at  $1/2$ ) fails to prove **RH**, but proving why provides substantial logical and technical support for this solution.

For example, despite nearly 3000 years of famous (yet wrong) opinions to the contrary, with great explanatory and predictive power, this work provides and confirms proof that any primal  $p_n$  can be precisely located, while simultaneously confirming its primality. (re: figure 1, etc., below) Obviously, that matters, because truth, reality, intrinsic and explicate complexity, symmetry, reciprocity, and metalogical relativity are as essential to  $\mathfrak{R}_\zeta$  as the enabling principles of numbers—primality, unity, integrity, identity, constancy, and the other principles integral to the functional potentials of numbers and maths. Being confused by erroneous beliefs and opinions of famous mathematicians and professors prevents good science and maths.

Other reasons for this remedial approach can be seen in original sources and relevant articles. For example, in the article on the Fundamental Theorem of Arithmetic<sup>[2]</sup> we find the semiotic cart hitched backwards in front of the logical horse:

“This theorem is one of the main reasons why 1 is not considered a prime number: if 1 were prime, the factorization would not be unique, as, for example,  $2 = 2 \times 1 = 2 \times 1 \times 1 = 2 \dots$ ”

(Wik 2016, 04-28)

Clearly, nothing could be more absurd, but such severe illogic and confusion is now the norm. Consider the logical alternative. Being the primary positive numeric unit, only 1's value is identified uniquely as itself. Yet, it is factorable (effectively divisible) only by itself. So, seeing either  $2 = 2 \times 1$  or  $1 = 1$ , or any numeric factorization as more primal than  $1 = 1 \times 1$  is clearly delusional. Of course,  $1 \div 1$  is a valid operation. So, QED.

Does that relate directly to **RH**? As proved here, primality is the most important property of primal numbers (AKA “primes”), not their factorizability. It depends on their primality. Being confused about unity, primality, and primal numbers was and is a major cause of **RH** and the long failure to prove it. For example, on  $\text{Re}^+$  at  $1/2$ ,  $\mathfrak{R}_\zeta$  maps an approximation of the distribution of primal numbers.

That makes the zeroes on the line of symmetry symbols of primality, unity, equality, relativity, and the other principles enabling  $\mathfrak{R}_\zeta$  and the graph. The zeroes on the negative side of the graph symbolize the same principles, but reflexively. They reflect the reciprocal primal duality of symmetry and asymmetry intrinsic to  $\mathfrak{R}_\zeta$  and its semiotic potentials.

However, the numeric and semiotic logic, primal duality, and singularity expressed with  $\mathfrak{R}_\zeta$  may still seem inscrutable and/or irrelevant. Yet, the rest of the proof enables understanding and certainty, with the integral logic of  $\mathfrak{R}_\zeta$  and its enabling metalogical principles. Consider an introductory example, the reverse of the Collatz algorithm, a recursive arithmetical “hailstone” cascade process. Also, recall that perfect reversibility of any mathematical process proves its fundamental validity and reliability.

Now, the Collatz cascade algorithm (**CCA**) starts with any whole number value ( $n$ ) and always reduces it to 1. In reverse, the **CRA** starts with 1 and, depending on intermediate values used, always produces final values of  $n$  that match any initial value used for the **CCA**. As proven below, proof of that proves **CC** (Collatz's conjecture). Thus, the **CCA** and **CRA** confirm the numeric logic and integral metalogical principles that enable  $\mathfrak{R}_\zeta$  and its semiotic reflections of primality (etc.). Of course, the **CCA** also demonstrates the uniquely primal originality of 1.

How does all that relate to **RH**? Confusion about numeric logic, primality, and ignorance of their enabling metalogical principles caused Riemann's uncertainty and prevented proof.

Clearly, the long lack of enabling realizations was possible only because of the deficiencies of metamaths and number theory necessary for perfect proof **RH** and optimum explanation. The defects of the post-medieval linguistic paradigm of Europe also kept Riemann and following investigators from seeing why they failed to solve the problem (**RH**).

In other words, they failed to see the true nature of the problem and its real roots. Seeing it eliminates the main cause of the difficulty. Yet, antique beliefs normalized illogic and linguistic

deficiency infected and retarded maths, then metamaths. So, pandemic confusion diverted all previous investigators, including Russell, Whitehead, and Hilbert.

Refusing to accept the original primality and positive unity of the primary numeric unit, 1, as a self-evident truth and proof of primality is living proof of illogic, confusion, and ignorance. So, Wittgenstein's insight about basic arithmetic logic was valid.

A rigorous proof of addition and  $1 + 1 = 2$  is obtainable by counting with fingers. The ancient Babylonian base-60 number system being based on the number of bones in our fingers and toes proves Wittgenstein's theorem. On the other hand, a more modern, sophisticated example of semiotic deficiency is the SOT (successor operation theorem). It says the Successor Operation is an irreducibly basic element of arithmetic logic. Yet, for all  $n$  of  $\mathbf{N}$ , subtraction of  $n - 1$  is the complementary reverse of  $n + 1$  in the serial sequence  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$ . That proves arithmetic validity.

So, in the progression of all  $n + 1$  (generating  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$ ), natural whole numbers are subsequent sums, also findable by regression with  $n - 1$  (from any subsequent sum). Proof is also verified by counting backwards toward 0 (the relative complement of unity), the well-named origin of  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$ ,  $\text{Re}+$  &  $\text{Re}-$ , and the unit circle ( $\mathbf{U}_C$ ). It is clearly no accident that the  $\mathbf{U}_C$  symbolizes the actual circle of unity (the principle) and its universal potential. Of course, nearly 5 millennia earlier, ancient Babylonians invented the  $360^\circ$  circle, 60 second minutes, 60 minute hours, and developed the sexagesimal system that enables modern geometry, mapping, and trigonometry (the  $\mathbf{U}_C$ ), including Riemann's work with complex trigonometric functions and his analytic non-Euclidian geometries (and  $\mathfrak{R}_Z$ ).

Now, if true, the SOT would make you a causeless operator generating successive results using arithmetic operations. However, any operation requires logical and metalogical principles that enable and sustain it, its results, and us. Yet, despite that, among other problems, the earlier theorems of arithmetic and number theory remained as fundamentally inadequate as modern, post-Hilbertian metamaths. So, emphasizing the importance of  $n + 1$ ,  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$ , and the numeric primality of 1, might seem excessive or silly. Yet, it exposes the deficiencies of incomplete number theory and the mostly absent metatheory of trigonometric functions, especially those with complex variables.

Repeatedly referencing the root of the problem helps clear the logical air. For example, Peano (and many others since) saw the Successor Operation as a fundamental element of arithmetic logic. Yet, as shown above, the word "operation" not only implies or refers to an operator, but also a previously existent locus or domain of action. Otherwise, no operations could ever be possible. Also, "successor" implies or refers to a dependent actuality, an entity (or identity) and a value relative to or in relationship with somebody, something, or everything. So, the terms "successor" and "operation" both imply interaction subordinate to the realms of metalogic, also to sociocultural realities and the psychophysical reality of being. Clearly, "fundamental" means basic, as in a conceptual foundation of irreducibly basic, enabling principles.

So, obviously, a vast majority of metalogical principles were missed by Peano, Frege, Cauchy, Franel, Cantor, Russell, Whitehead, Gödel, Hilbert, and even Wittgenstein, among others. For

example, in his paper “Major Arcs for Goldbach’s Problem”,<sup>[7]</sup> on the ternary odd number conjecture “**GC<sub>01</sub>**”), H.A. Helfgott admits seeing conditional proofs as partial, far from providing ideally acceptable proof. Yet, consider Helfgott’s references to **RH**, quoted below:

The questions are then: where are the non-trivial zeros  $\rho$  of  $L(s, \chi)$ ? How fast does  $F\delta(\rho)$  decay as  $I(\rho) \rightarrow \pm\infty$ ? Write  $\sigma = \Re(s)$ ,  $\tau = I(s)$ . The belief is, of course, that  $\sigma = 1/2$  for every non-trivial zero (Generalized Riemann Hypothesis), but this is far from proven. Most work to date has used zero-free regions of the form  $\sigma \leq 1 - 1/C \log q/|\tau|$ ,  $C$  a constant. This is a classical zero-free region, going back, qualitatively, to de la Vallée-Poussin (1899). (Hel 2013)

Oddly, despite his intellectual knowledge of the incompleteness of the attempted proofs (etc.), Helfgott thought that potentials and results of technical operations and conventional testing are sufficient. That is blatantly untrue. In the best proofs, inferior theorems and partial proofs are unnecessary, except as deficient counter-examples. Now, although  $\mathfrak{R}_\zeta$  is useful for various models and maths, even for approximating physical phenomena, its discreet internals, properties, and enabling principles are totally unlike exoteric natural processes.

Yet, as it must have for Sir Michael Atiyah, it seems tempting to think of **RH** and  $\mathfrak{R}_\zeta$  in the context of QM physics. However, ignoring the deepest levels of mathematical structural logic and generative principles of  $\mathfrak{R}_\zeta$  (implied in **RH**) was always counter-productive. Therefore, like his predecessors and contemporary colleagues, Helfgott failed to recognize the cause of the historic detours that diverted Riemann from beginning more effective work on **RH** (and metamaths).

## Discrete & Continuous Maths & Logic

“Problems cannot be solved at the level of thinking that caused them.” – Einstein

Riemann’s obsessive interest in relating continuous and discrete maths—for approximating the distribution of primal numbers (in  $\mathbf{N}$ ) and exploring continuous processes and potentials—was productive, but clearly inadequate. Failing to understand his own discovery, he failed to prove his most interesting hypothesis. Likewise, in failing to enable full understanding and definitive explanation—of  $\mathfrak{R}_\zeta$  and its results (at  $\text{Re}+ = 1/2$ )—simply technical, operational proofs fail to offer a fully satisfactory solution of the problem (**RH**).

Consider the nature of  $\mathfrak{R}_\zeta$  and its results. When the real part =  $1/2$ , the results can only be understood as expressing the relationship of the maths of discrete and continuous processes. For example, the definitive limitations of discrete values and potentials of whole integers and their use in arithmetic limit their usefulness and relational potential. Yet, the logics and operations appropriate for approximation and partial description of continuous processes are only partially compatible with discretely definite numbers, constructs, and the potentials of highly complex functions and additive progressions.

That is so because partial compatibility and approximation are not exactly perfect, nor sufficient for actual precision. For reference, consider Goldbach’s original ternary conjecture, **GC<sub>01</sub>** (stated when 1 was still prime), that “odd numbers  $n \geq 7$  are the sum of three primes.”

Technically and logically, that problem pales by comparison to **RH** and **GC**. So, using secondary or tertiary level ‘old school’ theorems and technical maths to prove **RH** or to explain the nature and potentials of **GC** or even **GCT** is pure futility. The operations of discreet and continuous maths and the deep issues implicit in both **RH** and **GC** belong to different domains and levels of logic.

So, we can understand why Russell, Whitehead, Gödel, and Hilbert wanted to eliminate all the illogical defects and deficiencies. Yet, remember, it was the deficiencies of antique ontology, epistemics, and semantics that hindered Riemann and kept limiting the paradigm and technical potentials of maths. Clearly, ever increasing complications and confusion are what kept **RH** unsolved for so long.

Consider the realities. Composite numbers  $n_c$  are punctuated by the primals ( $p_n$ ) per the enabling principles expressing and sustained by their enabling metalogical principles. They determine the positions of the primal numbers between the sequences of nonprimal multiples. That and the way to easily locate all primal  $p_{n \rightarrow \infty}$  (and all  $(p, 6n, q) > (5, 6, 7) \in NS \rightarrow \infty$ ) are shown (graphically) below.

The essentials are simple. For example, Euclid’s proof about primal infinity also proves the logical corollary, the potential infinity of the nonprimal composites, determined by their nature and potentials. Thus, the orderly nature and structure of their sequences and relations will remain reliable forever. So, changeless logical constancy ensures each successive location of the primals, the only  $n$  not multiples of  $n$ .

Also recall that, despite the constant symmetries, the orderly complexity of nonprimals ( $n_c$  of  $S_{N \rightarrow \infty}$ ) increases with their quantity (in  $\mathbf{N}$ ). That causes increasingly greater size and intrinsic complexity of primal number values ( $n_p$ ) as  $S_{N \rightarrow \infty}$ . Therefore, we can understand the seemingly random locations and internal structure of nonprimitive  $n_p$  (and their reciprocals) as numeric expressions of logical meta-symmetry and asymmetry (relative to the nonprimal numbers, AKA composite multiples).

Now, reconsider the nature and logical basics of form. Any kind of form, even unity, requires the existence of something else, at least nothing, formlessness, or everything else. So, we can admit the primality of 2. Then, we should accept the reality of the primal dyad, mathematically symbolized by 2, or 0 and 1 together (**0,1**). Both 1 and 2 then represent  $P$  (primal unity) and the logical relativity ( $\mathcal{R}$ ) of primal individuality (or identity,  $I_P$ ). That confirms primal duality ( $D_P$ ) and dyadic identity ( $I_D$ ). Then, unity and oneness—intrinsic to all objects, entities, identities, and numbers (embodying or expressing relative individuality)—make 1 prime prime ( $\wp P$  or  $P_0$ ), the primary numeric expression of oneness. So, we can let 1 or  $\wp P$  represent the most primal realities of all phenomena: universal being, existence, integrity, and the totality of unity, but also of arithmetic. (see section 1.2 above).

We can then ask, “Could **RH** be true simply because of the nature of numbers and maths?”

If natural universal principles enable and sustain the properties and potentials of oneness, twoness, halfness, symmetry, geometry, and arithmetic, even in operations with functions on complex numbers in infinite sums of reciprocals (with complex exponents), then we may be sure that those generative, enabling and sustaining principles can enable and sustain **RH**. Thus, this work shows how and why the answer is “yes.” **RH** is true because, among other things, primality, functionality, and the totality of unity are enabled and sustained by the natural principles enabling all of maths and logic.

They also enable and sustain the nature of proof, integrity, definability, and explainability. This solution and related proofs are also affirmed by the essence of many other works—by Pythagorus, Euclid, Gauss, Euler, Cauchy, Peano, Frege, Godel, Liebnitz, Ramanujan, Collatz, Chebyshev, Franel, Farey, several other mathematicians, and also by great geometers of ancient Babylonia, Egypt, India, and the Muslim empires. However, this multi-level ensemble of unconditional proofs provides comprehensive proof and definitive explanation of the problem and the solution.

## 2.2 Metamathematics

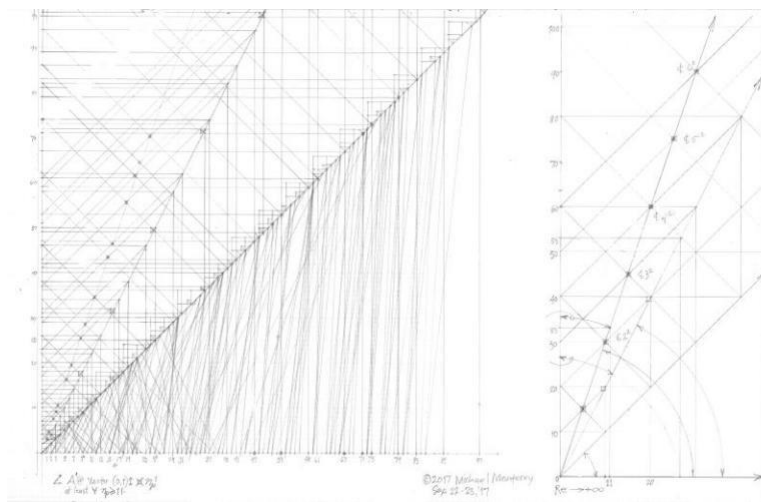


Figure 1, a & b: Graphs, mapping  $n$ , squares, primals & multiples in  $\mathbf{N} \rightarrow \infty$

“Every mathematical discipline goes through three periods of development: the naive, the formal, and the critical.” – David Hilbert

### Deconstruction

The graphs in figure 1 stand as graphic proof that the critical, final, holonomic, third stage of development of metamathematics (metamaths), number theory, and mathematical semiotics (etc.) has begun. Of course, those rough first drafts only show the beginning of what can be discovered with simple mappings of numeric logic. For example, the graphs (in fig.1, a & b) express (and prove) natural metalogical principles that enable **a)** numeric logic, **b)** the exact locations of [“primes”] primals and the nonprimals, and **c)** the reciprocal metalogical relativities

of all natural whole numbers,  $n$  of  $\mathbf{N}$ . Yet, orthogonal graphs mapping them with the [base-6] heximal number system will enable easier recognition of the numeric morpho-structural logic of the primals  $p$  and nonprimals  $n$  in the sequential progression  $\mathbf{S}_{\mathbf{N} \rightarrow +\infty}$ . How all that relates to proving **RH** is central to the subject of all the following content.

For example, the key technical issue in **RH** is reliability. So, if the maths, numbers, numeric logic, and natural principles enabling  $\mathfrak{R}_\zeta$  are reliable, then **RH** is true. Hence, this logical proof—with principles enabling holonomic metatheory (of metamaths)—has a triune purpose. It proves, verifies, and explains **a**) the enabling principles of maths, **b**) how and why they enable the results of  $\mathfrak{R}_\zeta$  (on  $+1/2$ ), and **c**) why the defects and deficiencies of metamaths were partly responsible for the long failure to understand  $\mathfrak{R}_\zeta$  and Riemann's most famous hypothesis (**RH**).

First, as shown in fig. 1b, the lines—through the centers and upper right corners of the squares (of  $n$ ) above the  $45^\circ$  bisector (of the map of  $\mathbf{N}$ )—prove the infinite reliability of the numeric logic enabling numbers, their properties, relations, and functional potentials. Otherwise, the lines through the upper right corners and centers of every square (of  $n$  above  $\mathbf{N} \rightarrow +\infty$ ) would not be  $2:1 \rightarrow +\infty$  and  $3:1 \rightarrow +\infty$  (above the  $1:1 \rightarrow +\infty$  of the map's bisector).

So, multifaceted proof proves Hilbert right again, metamaths is finally in its critically formal phase of development. Finally, the same is also true of number theory, set theory, and proof theory (etc.). Developing definitive metatheory for those 3 disciplines enabled and supports definitively perfect proof of **RH** (etc.). It also proves Hilbert (and his successors) wrong about sets. This section also proves that Gödel's incompleteness theorem (**GIT**) and his proof still hold true.

So, **GIT** supports this upgrade of metamaths and its new metatheory of systematic set theory, supporting proof that satisfactory solution of **RH** required better theory and metatheory of maths. So, this metatheory of metamaths also disproves the sufficiency and necessity of the Zermelo-Fraenkel theory (ZFT, its assumptions, illogical axioms, and invalid tautologies). Also, as proven below, constructivity and the axiom of constructability fail to prevent disputability, refutability, and disproof. That is now possible using proof theory congruent with the principles of logical actuality and valid metatheorems of holonomic metatheory.

## Proof theory & metatheory

Consider the formerly missing/under-valued principles and meta-axioms of proof theory:

0. Actuality (signifies & enables being, universality, identity, quality, duration, etc.)
1. Reality (signifies & confirms actuality, validity, congruency & realization)
2. Integrity (signifies & sustains actuality, unity, regularity, visibility, viability, etc.)
3. Relativity (signifies & enables reciprocity, compatibility, priority, distinction, etc.)
4. Definability (signifies & enables understanding, provability & explanation)
5. Recognizability (signifies & enables thinkability, definition & validation)
6. Explainability (signifies & enables understanding, knowledge, logical integrity)
7. Disputability (signifies deficient explainability, potential refutability or disproof)
8. Falsifiability (signifies & enables detection of valid/invalid acceptability or anomaly)



## 9. Certainty (signifies & enables reliable proof, understanding & satisfaction)

The ninth principle listed (#8) was well-known, but under-used or ignored or disbelieved by most post-Einsteinian mathematicians. For example, thinking that an unfalsifiable doctrine, theorem, or hypothesis (about undetectable and/or inexplicable phenomena) is scientific theory violates the basis of scientific theory and practice. That clearly requires either unrecognizability or ignoring illogical incompatibility (with the principles of science and being, *i.e.*, reality). Also, making up excuses and/or new rules to falsely circumvent actual and/or virtual reality (and the enabling principles of being) only seems to justify acceptance of a bad theory and increasing anomalies (false mysteries caused by deficient knowledge and theory).

As proved in the subsection on set theory, defects of bad theory and illogical dogma will never be justified. Obviously, the first 8 principles of proof enable and confirm the validity and viability of falsifiability (for detecting falsehoods about the unknowables of being). For example, the origin of being, the cosmos, and its enabling principles, or other mysterious realities can only be understood with intuition, direct insight, and/or with a sufficient basis of valid ontological metatheory. Claiming to decode real mysteries with mathematical operations (and assumptions about the results) requires anti-scientific illogic. The worst examples always relate to the abuse of logic and theory to make a potentially understandable phenomenon seem like an unknowable anomaly (an artificial mystery). So, falsifiability enables detection of ignorant error or misunderstanding, misinterpretation or misperception and illogical theory. They cause the invalid acceptability of immature science and maths.

That prevented realization of the tenth principle and meta-axiom of certainty, the goal and purpose of science, maths, and proof. Now, it may seem that the above principles and definitions were already integral to modern metamaths and proof theory. However, the proofs of **RH** (etc.) prove otherwise.

Of course, several improvements and additions to metamaths (the philosophy of maths), set theory, proof theory, and number theory, enable further development of better maths and theories of complexity, chaos, ontology, phenomenology, epistemics, cosmology, physics, psychology, and science in general. That happened because essential principles and elements enabled progress to this critical phase of development. So, a brief critique of defective metamaths can enable easier transition to the next paradigm.

### Intuitionism

Consider the deficiency and failure of intuitionism (*Int*). Its main tenets and postulates all suffer from illogical weakness, debilitating error, insufficiency, and/or unrealistic presumption. For instance, *Int*'s rejection of actual infinity requires illogically torturous limitation of evolutionary thinking. Implicitly, it also assumes that further development could never reach a greater level of understanding. So, *Int* prevented viable holotropic metatheory of valid metalogical principles and metatheorems. Hence, before this project began, *Int* prevented definitive explanation of the metalogical principles that enable actual infinity, being, maths, and  $\mathfrak{R}_\zeta$  (and **RH**, etc.).

Clearly, rejecting actual infinity prevents more realistic metatheory of logic and reality. So, *Int*'s postulate of 'effective constructability' was not effective enough to remedy its other deficiencies (and prevent failure). *Int*'s defining criteria for defining objects of maths were too limited, and the required exclusivity prevented viable proof and reliability. Likewise, *Int*'s limitation of objects of construction only to natural numbers and their aggregates, to be treated only as uncompleted potentials was unrealistic, thus self-destructive. So, all that and its other problems, doomed *Int*'s limited application of classical logic to permanent insufficiency and well-deserved incredulity.

Formalistic finitism, logicism, etc.

Of course, that was also true of Hilbert's tortured, semi-defined finitism and of formalism in general. Its deficient and missing definitions guaranteed uncertainty, and certainty is essential to the goal and purpose of science, maths, and proof. So, finitism and formalism failed to progress to a generally acceptable metatheory of a unified field of metamaths.

Before that, logicism also failed for illogical reasons. Frege achieved important yet insufficient metatheory. Russell and Whitehead improved Frege's results, but **GIT** and Gödel's later works ended hope that logicism could prevail and dominate metamaths. Yet, failure spawned the inadequate idealism of 'mathematical' Platonism (MP). An ironic fact of MP was its maxim that the quest of a metamathematical investigator is discovering the 'laws' ruling its domain of abstract objects. Yet, incredibly, as stated in the Encyclopedia of Mathematics,<sup>[2]</sup>

"...logicism is absorbed in the set-theoretical foundation of mathematics..."

Yes, set theorists hijacked metamaths and proof theory. So, they strayed further from logical reality. Structuralist and constructionist projects also fail to integrate metamaths for most of the reasons mentioned above and below. As in the ancient classical approach to logic, structuralism works for what practitioners do with it. Yet, it, like the other contenders, suffers from logical and metalogical deficiencies that prevent general acceptance and sustainable dominance.

The improvements and proofs provided below prove and confirm the facts, and the validity of the solution. That truth, and verification of this critique are clearly visible in the nature, truths, and implications of the following example (ignored or unappreciated by most theorists of maths and physics).

Regularity & relativity

The Newcomb-Benford curve (or "first digit rule" of distributions),<sup>[2]</sup> is an amazing proof of regularity (the principle) and nature's very orderly metalogic of other enabling principles. The curve shows nature counteracting or neutralizing seemingly causeless chaos, meaningless randomness and entropy. The discovery was first made public in 1881 then, more formally, in 1938, in Frank Benford's paper *The Law of Anomalous Numbers*.

Oddly, both Newcomb and Benford failed to see the evidence verifying nature's enabling principles. Yet, they clearly demonstrate regularity and irregularity, the enabling metalogical principles, among others involved. Nor did they revolutionize the development of metamaths

and science in general. Maybe the last several hundred years of Euro-American zeitgeist made mathematicians and scientists squeamish about challenging popular dogmas. Obviously, when anomalies proliferate, threatening status quo darkness, conventionally conditioned egos turn away, wanting to feel more secure.

That may over-state the problem, yet the Newcomb-Benford curve demonstrates the natural distribution rule (**NDR**). It applies to an astounding number of natural phenomena. So, the **NDR** directly supports the proofs, theory, and metatheory provided here. It also seems likely that many distributions not ruled by the **NDR** are ruled by the ‘power law’ of proportional relative change (**PRC**). So, both the **NDR** and the **PRC** prove the *a priori* actuality, existence, validity, and viability of intrinsic metalogical and logical principles that enable and govern universal phenomena, including  $\mathfrak{R}_z$  (and numbers, maths, geometry, music, etc.).

Luckily, the **NDR** and **PRC** support negentropy, and the new thermodynamics discovered by Nobel laureate Ilya Prigogine. They also support the new numeric metatheory of primality, and more. Clearly, nature’s preference for quantities and things numbered per the primary sequences of each order of magnitude **M** (from **M0** to **Mn...→∞**) expresses the principles enabling the relativity of the extensions and expansions of unity and its intrinsic primality and infinity.

For example, the predominant prevalence of **n** with initial digit  $d_i = 1$  supports proof of the metalogical primality and primacy of 1 (and both logical and actual unity), reflected in and by the **NDR**. Therefore, we have

$$\text{Metatheorem A: } \because n = 1 \wedge 1 \dots \rightarrow \infty \subset \{M_n\} \rightarrow \infty \subset \{S_N \rightarrow \infty\} \therefore 1 \vee 1 \dots \rightarrow \infty \subset \{U_P \rightarrow \infty\} \equiv P_P \text{ and} \\ \therefore P_P = 1 \blacksquare$$

Translation: Because numeric unity and any logical values of 1 are congruent logical subsets of the set of all numeric magnitudes, they are also subsets of the summary progression of  $n + 1$  (serial sequence  $S_N \rightarrow \infty$ ). Therefore, logically, unity or any values of  $1 \dots$  are subsets of primal unity, which is strictly equivalent to original primality. Therefore, the prime primal number is 1 and, metalogically, all  $n = 1 \dots \rightarrow \infty$  are strictly equivalent extensions of primal unity, expressing its infinite integrity. So, metatheorem A is true, and the **NDR** is valid.

Thus, the **NDR** proves the basic assumptions of modern set theory insufficient, illogical, and invalid. Further proof of regularity, acceptability, and the primal primacy of 1 are included in following sections. The truths are also supported by the fact that the wonders revealed by the **NDR** are not simply numeric flukes of the decimal, base 10 number system. The **NDR** works with any other system, base, or Mod **n**.

So, the **NDR** and **PRC** proves nature’s systemic metalogical relativity (enabling all of maths, metamaths, and set theory), and the intrinsic priority of primal primacy. So, a metatheory of proof and sets can include, describe, and explain the relativity and priority of regularity and primality as essential principles of being and maths.

How and why that relates to  $\mathfrak{R}_z$  and **RH** are explained and proved in the sections following the proof with metamaths.

## Meta-axiology

Calling zeroes in the graph of  $\mathfrak{R}_z$  (on the line of symmetry) “nontrivial” and “trivial” reveals a matter of generally unquestioned opinion, based on a very questionable value judgement. Of course, many other traditionally maintained examples of illogical value judgement and opinion confused mathematicians of the past and present. A meta-ontological upgrade of metamaths and proof of **RH** requires sufficient definition of value and values. That requires axiology and meta-axiology, the science of value and its nature, its enabling principles. It enables good theory and optimum proof and knowing why they matter.

For example, for QM, cosmology, and most religious traditions, “darkness” refers to ignorance (re: “dark” energy/matter and space), or delusion or confusion, or evil. Normally, such ideas and beliefs are based on and maintain socially programmed, culturally enforced, subliminal value judgements. Therefore, most schools, mathematicians, and their associations suffer from normative prejudice. That retards society and science, including maths, maintaining commonly held norms, socioeconomic power dynamics, and systemic corruption. So, current paradigms of society, science, and philosophy become increasingly invalid and obsolete as ever more people become increasingly confused about reality, truth, opinion, value, and the meanings of words.

Meta-axiology enables de-confusion (of values and beliefs about maths, proofs, etc.). Escaping normalized confusion enables seeing “the light” of reality, the nature of being and true value, goodness. So, we can accept the fact that opinion and truth and assumption and axioms are not synonyms. For example, axioms may be true or false or provisionally viable; and they may be based on partially erroneous assumptions and totally invalid opinions commonly accepted as truths. If the preceding claims were untrue or irrelevant then **RH** might have been proved by Riemann or somebody else during his lifetime.

Most logicians know the difference between truths and opinions and assumptions, yet still not be aware of their own subliminal confusion, bias, and invalid opinions. So, immature maths and metamaths are commonly assumed to be based on axioms based on truths, realities, and valid assumptions. In fact, the pioneers of 19<sup>th</sup> century maths and early metamaths assumed that proofs of axiomatic systems of logic were good enough to be reliably valid, until Kurt Gödel’s incompleteness theorem (**GIT**) and proof was published. Then, “modern” metamaths started coming apart at the seams, literally. Nor was it ever good enough to stand being unfinished, without its practitioners abandoning logic, reality, and validity.

The decay and perversion of metamaths then spread to the theory and metatheory of numbers, sets, proof, information, QM, game theory, and the rest of maths. Thus, fundamental illogic and normalized confusion gradually infected modern societies. Part of the problem was that, after Boole, the pioneers of maths were still missing most of the enabling metalogical principles of logic. Being partly mistaken, they missed important possibilities and potentials.

For example, this multi-faceted proof of **RH**, etc., proves that “natural” numbers and Riemann’s zeta function & formula ( $\mathfrak{R}_\zeta$ ) are enabled and governed by principles that also enable valid meta-axioms and the rules of maths. Indeed, the principles of maths can only be enabled by natural metalogical principles, not by assumptions and conceptual inventions. Realizing that can and did enable logical proof of **RH**.

Now, metamaths and the philosophy of maths will never be completely finished (unless we are). Yet, holotropic metatheory could keep evolving to ever greater holonomic sufficiency and usefulness. For instance, though an extensive review of *Principia Mathematica* (PM) and **GIT** and Gödel’s proofs are beyond the scope of this paper, the new metamaths, meta-axioms, and meta-formulas can enable valid completion of PM. Also, though all possible meta-axioms of viable metamaths are not formalized here, that was unnecessary for proving its necessity and validity. It was possible because the problem that obscured the truth of **RH** and retarded metamaths was unrecognized confusion caused by deficient theory, maintained by deceptive beliefs, regressive opinions, and academic corruption.

Hence, without the requisite psycholinguistic tools—essential principles, valid ideas, semantics, semiotics, etc.—fully understanding  $\mathfrak{R}_\zeta$  was impossible. That prevented fully logical, absolute proof of **RH**. Discovery and use of the enabling metalogical principles and mental tools enabled correcting, extending, and expanding metamaths to include, describe, and explain the natural principles and facts that enable it and maths (and reality, etc.).

For certainty, consider a modern counter-example. Most mathematicians now assume that even Euclid’s axioms of geometry are merely assumptions, not realities of geometric logic (expressing enabling metalogical principles of being). That was caused by the deficient vocabulary and beliefs of ‘modern’ mathematicians, mostly since the 18<sup>th</sup> century. The nature and essential tools of holonomic metamaths are shown and explained, below.

For example, Euclid let the parallel line axiom ( $A_{pl}$ ) seem almost independent of 3D geometry’s other elemental axioms, but the system is functionally perfect. Yet, unlike its other axioms the  $A_{pl}$  cannot be derived by using the other axioms. So, despite its intrinsic functionality, Euclid’s theory of geometric logic ( $G_{3D}$ ) seems incomplete and partially inconsistent.

However, we can accept the actuality of natural principles enabling physicality, mentality, semiotics, geometry, maths, and metamaths. So, Euclid’s  $A_{pl}$  is now derivable and provable with meta-axioms, within the metalogical context of  $G_{3D}$ . It will also be possible with a holonomic upgrade of PM ( $PM_H$ ) and the new metatheory of proof.

In other words, parallel lines are possible and can be defined with Euclid’s  $A_{pl}$  or a meta-axiom ( $A_{Mpl}$ ) because metalogical principles enable the principles of actuality, form, structure, function, operational semiotics, and geometry ( $G_{3D}$ , etc.). So, we can safely accept the possibility, reality, and potentials of fundamental metalogical principles, meta-axioms, meta-tautologies; and the elemental relations (enabling  $G_{3D}$ ) that enable the necessity and sufficiency of  $A_{pl}$  and  $A_{Mpl}$ . That implies sufficient necessity and possibility of new metatheorems and meta-finitistic proofs that formerly seemed beyond metamaths.

Obviously, per the truth of GIT, such proofs cannot be mirrored/expressed within PM without upgrading it. Still, many mathematicians intuited the possibility, but without discovering the necessary, sufficiently well-defined set of meta-axioms and a holonomic paradigm of finitism. Now, because of the enabling principles—especially the principles of possibility, necessity, and permanence—a valid metaproof holds true for  $PM_H$  and non-Euclidean geometries ( $G_{nD}$ ), for  $C_\infty$  (the virtually infinite number fields of the “complex plane”), and for Riemann’s complex trigonometry.

Thus, without violating the logic and proof of GIT, a valid holonomic metatheory (of enabling metalogical principles) enables proof of its own metalogical consistency and completeness. That means that the same is true of  $PM_H$  and similar meta-axiomatic systems. So, consider some preliminary formalization. For example, let  $P_{ml}$  represent metalogical principles and let  $U^\infty$  mean the unity of universal being (the cosmos, all that is). We can then prove a valid, fundamental, metatheoretical tautology

Metatheorem B:  $\forall P_{ml} \in U^\infty \supset P_{ml} \wedge \therefore P_{ml} \supset U^\infty$  and  $\therefore \exists \{P_{ml}\}^\infty \cup \{U^\infty\}$  ■

Translation: All metalogical principles of universal being are necessarily elements of and integral to (and enable) the infinite totality of universal being. So,  $U^\infty$  is actual the super-set of elemental metalogical principles enabling all phenomena and all entities (including the universe) and itself  $\{P_{ml}\}$ ; and, so, the transfinite set of enabling meta-logical principles is also a super-set of universal being (as a whole); and, therefore, the infinity of metalogical principles and the infinite set of all universal phenomena (including their intrinsic enabling principles) are interdependent, nondual, and congruent. QED. The unity of reality is real.

So, as proved below, holonomic metatheorems also resolve Russell’s Paradox with valid meta-axioms. After all, principles are discreet nonphysical phenomena that enable energetic physical and mental phenomena. So, we know that they exist as integral elements of the nature of being, the cosmos. Yet, being definite but nonphysical phenomena, the nature of principles makes them changeless, beyond the effects of physical causes (forces, etc.), making them of infinite duration. We also know that ensembles of many enabling principles may exist as intrinsic elements of the nature of each being and all physical forms or modes of being. That makes intrinsic enabling principles constantly more numerous than the beings, things, events, and processes that they enable and sustain. Therefore, we can be sure that even if the set of enabling principles is not numerically infinite, its nature and the nature of its elements (principles) are infinite.

Hence—as an element of  $PM_H$ —metatheorem B is valid; and the meaning is also metalogically and actually true. That is possible because holonomic metamaths and  $PM_H$  include metalogical meta-axioms and metatheorems based upon realities. So, they express and define or describe universally natural actualities and realities (that are finite and transfinite and/or infinite).

We can also understand  $U^\infty$  as the domain of all possibilities (including stupidity and illogical mistakes) and all potentials. Potentials include virtual, as yet unembodied, or unexpressed possibilities. For verification, recall that in maths and logic theory, a tautology is a statement or formula or theorem true in all possible worlds (in/of this universe, as is).

So, disproving metatheorem B requires disproving the existence of the universe, being, and you.

Thus, without disproving the reality of ourselves and everything else—including mentality, information, semiotics, communication, logic, maths, geometry, principles, etc.—disproof is clearly, logically, and actually impossible. So, we can discover and prove meta-axioms and metatheorems that prove and support the logical consistency and completeness of holonomic metamaths, holonomic proof theory, and holotropic number theory.

For example, consider this, the following formula of modern metamaths (re: Hofstadter, Nagel & Newman)<sup>[7]</sup> can be easily understood with a holonomic metatheorem (following it, below).

$$'((p \supset q) \supset ((r \supset s) \supset t)) \supset ((u \supset ((r \supset s) \supset t)) \supset ((p \supset u) \supset (s \supset t)))'$$

Now, for absolute proof of  $PM_H$  and that a holonomic system of meta-axioms is consistently noncontradictory and logically complete, a more universal example helps. So, let  $p$  be physical phenomena and  $q$  symbolize identities, ideas, images, illusions, and delusions. Let  $r$  represent reality and  $s$  stand for stupidity. Also, let  $t$  represent things, and let  $u$  and  $U^\infty$  symbolize unity and the universe (the infinite set of all phenomena); and let  $c$  mean confusion. Now, per

$$\text{Metatheorem C: } \{(p \supset q) \supset ((r \supset s) \supset t)\} \supset \{(u \supset ((r \supset s) \supset t)) \supset ((p \supset u) \supset (s \supset t)) \supset c\} \rightarrow p \vee q \wedge r \\ \therefore u \equiv \{\{U^\infty\} \cup \{P_{mi}\}^\infty\} \equiv \{r \vee q \wedge p\} \rightarrow c \wedge v s \blacksquare$$

Translation: The sets of expressions in bold curly brackets show the relations as integral to and enabling infinite sets  $\{U^\infty\}$  and  $\{P_{mi}\}^\infty$ . So, because of physical possibilities, it is a super-set of illusions and/or delusions; and, yet, we can experience reality, which enables and includes stupidity. All that is a super-set of things (which may or may not be what they seem, re: 'dark' stuff, space, illogical numbers, random sequences, etc.) which become part of the universal super-set (of all phenomena and) unity. That forms the super-set of stupidity and its elements (stupid things) as expressions and embodiments (of reality and stupidity) and other things. Of course, all that is a set that implies (and enables) the possibility of actual or virtual phenomena or delusions and reality. Therefore, due to unity's nature, it is strictly equivalent to natural set  $\{\{U^\infty\} \cup \{P_{mi}\}^\infty\}$ , universal being's infinite totality and the infinity of its metalogical principles. Still, its nature being  $\{P_{mi}\}^\infty$  makes the natural set strictly equivalent to the reality of either virtual or actual phenomena. That implies and enables the possibility of confusion and/or stupidity (thus many wild goose chases).

Now, naturally, more phenomena can lead to more conceptions of cosmic reality, then more expressions of stupidity, then more things. That increases general confusion, which leads to excesses of real and delusional phenomena. So, we see  $(p,q) \in \{U^\infty\} \equiv r \equiv u$ . More briefly: unity, reality, and the universe are logically identical, and consist of actual and virtual phenomena. QED. Metatheorem C is sufficiently proven and verified.

Of course, Metatheorem C could be simplified and, more importantly,  $s$  can refer to "stupidity" plus "sensory perception" (with all its possibly infinite varieties, species-specific limitations, defects, etc.). That may seem nicer, but it is also more useful. We could also let  $s$  mean symbols

(or symbols + senses + stupidity). That seems more appropriate to this project and the human dilemma. In fact, most of the time, most if not all of us seem normally unaware of the nature of symbols, the limitations of our senses, and of common silliness.

So, we can let the above support the proof of the consistency and potential completeness of holonomic metamaths. For example, if we let S mean sanity or sentience, and ~S mean insanity or nonsense or absence of sentience, while understanding that  $r \wedge p \wedge u$  enable both S and ~S then, personally, at the least

$$((S \wedge \sim S) \supset r \wedge p \wedge u)$$

As is shown below, that tautology is a provable metatheorem of holonomic metamaths, enabled by its holotropic domain of discourse and by

Metatheorem D:  $\{U^\infty\} \supset (\{P_{ml}\}^\infty \wedge U^\infty) \equiv (r \wedge S) \therefore \{((P_{ml} \wedge S) \supset (r \wedge p \wedge u) \supset \sim S)\}$  ■

Of course, that metatheorem is supported by the natural sciences, phenomenology, psychology, and holotropic ontology (macro-ontology and meta-ontology, holontology). For example, sanity is best defined as effectively functional sentience. Yet, remember, the existence of insanity and dysfunctional sentience requires information and knowledge only obtainable with S. As shown below, S is enabled and sustained by the metalogical principles of physicality and mentality (among others). So, without S, ~S would have been impossible, and nobody would know of it.

So, even if the premises seem dubious, metatheorem D is clearly true. Thus, it explains the late J.F. Nash, Jr.'s living example, and how the Cold War intensified the pandemic of normalized insanity maintained by ecocidal societies and kleptocratic capitalism. QED.

In fact, sanity, sentience, and mentality are inseparably and interdependently relative to their complementary logical opposites. Now, tautologies are valid only in valid metatheory. So, we must only accept those verified by the realities of irreducible, elemental truths—observable, testable, provable, reliable certainties—of geometry, numbers, maths, and/or universal being. Thus, the consistency and completeness of holonomic metamaths exists because the nature of reality and its enabling principles are holomorphic, automorphic necessities, enabling all possible events, phenomena, beings, processes, and potentials, including maths. Hence, letting s mean symbolic semiosis, then

Metatheorem E:  $\{(r \wedge p \wedge u) \supset (S \wedge \sim S)\} \therefore \{(p \wedge s \vee n) \cup (\{N_\infty\} \supset n) \cup \{U^\infty\}\}$  ■

Obviously, the metalogical principles of being enable its infinity of real, possible phenomena. Likewise, reality, phenomena, and/or their unity can be considered a super-set of sanity and insanity. Therefore, phenomena and semiotic symbols or numbers exist as subsets that can unite the infinite superset of all numbers, inseparable subsets of the infinite superset of universal phenomena, AKA being. Hence, logical congruency of true knowledge and reality enable and verify meta-axioms of holonomic metatheory. QED. Metatheorem E was always true.

How do those metatheorems relate to  $\mathfrak{R}_\zeta$  and **RH**? As implied before, above,  $\mathfrak{R}_\zeta$  was the result of Riemann's fascination the primal numbers, and obsessive quest to find a way to approximate their quantity (up to various  $n$  of any magnitude) and distribution among the nonprimals.



Fortunately, intuition, study, and experiment led to his success. Unfortunately, Riemann failed to see why, preventing the solution of his problem (**RH**). He also failed to wonder about the relationship of reality and real numbers, their real roots, and their causes.

Clearly, nor did Riemann ask himself how or why a conceptual line at  $\text{Re}+ = 1/2$  could relate to symmetry, unity, 1, duality, 2, to absence, 0, and to quadrant 2 (Q.2) of  $\mathbf{C}_\infty$  and  $-\mathbf{N}_\infty$  (negative numeric infinity). If he had wondered sufficiently about the nature of those relations and causal principles, Riemann may have found the answers and developed this complex set of proofs, and the basis of viable metamaths, a holonomic metatheory of maths.

So, despite the amazingly close approximation of quantities, distributions, and sequential patterns of the primal numbers in  $\mathbf{N}_\infty$  with the zeroes of  $\mathfrak{R}_\zeta$  (on the line at  $1/2$ ), neither Riemann nor other investigators investigated the cause. Why those enabling principles remained ignored for so long—in spite of being expressed by the graphs (of  $\mathfrak{R}_\zeta$ ) and in the terminology (used to discuss it)—may seem mysterious. Yet, their reality proves the root cause of **RH** and the long string of failures. Thus, metatheorems A, B, C, D, and E prove that the cause of the problem and the failures was also the deficient **a**) metamaths, **b**) ontology, **c**) semantics, and **d**) sanity of the post-Dark Age sociocultural paradigm of civilization.

Obviously, realistic metamaths relates to  $\mathfrak{R}_\zeta$  and **RH** because their “natures” are the principles that enable their existence, their properties, functions, potentials, and reality itself, the cosmos. So, it can seem very odd that the development of metamaths could go so wrong for so long.

How and why? Maths, metamaths, and logic were originally appreciated and practiced like any pure science. For nearly a century, instead of being a unifying foundation of metatheory, modern metamaths suffered from self-limiting factions, deficient set theory, and non-unified metatheories. Hence, at least since the end of Gödel’s later works to the beginning of this work, the way to develop a unifying basis of metatheory remained unknown.

Therefore, beyond the normal mind-set of the pioneers of maths, the unthinkable realities were invisible. Then, considering the reality of primordial principles of universal being was of little or no interest to most modern mathematicians. If that were untrue, Gödel and Cantor may have died happy, not tragically frustrated. Now though, even Russell’s paradox can be resolved with valid metalogic and Cantor’s paradox and theorem **CT**:

*Cantor’s paradox* is based on an application of Cantor’s theorem. *Cantor’s theorem* states that given any finite or infinite set  $SS$ , the power set of  $SS$  has strictly larger cardinality (greater size) than  $SS$ . The theorem is proved by a form of diagonalization, the same idea underlying Richard’s paradox. Cantor’s paradox considers the set of all sets. Let us call this set the *universal set* and denote it by  $UU$ . The power set of  $UU$  is denoted  $\wp(U)\wp(U)$ . Since  $UU$  contains *all* sets it will in particular contain all elements of  $\wp(U)\wp(U)$ . Thus  $\wp(U)\wp(U)$  must be a subset of  $UU$  and must thus have a cardinality (size) which is less than or equal to the cardinality of  $UU$ . However, this immediately contradicts Cantor’s theorem. – from Stanford’s online encyclopedia

Resolution is provided by universal being, denoted  $\{\mathbf{U}\infty\}$ , the real set of all sets, including its integral enabling principles ( $P_m$ ). So, as proved in the metatheorems given above, the cosmos is the ultimate infinite set  $\{\mathbf{U}\infty\}$ , of all phenomena, possibilities, entities, groups, classes, and

types, including set  $\{P_{ml}\}$ . Therefore, the real power set is  $\{\wp(\mathbf{U}\infty)\wp(\mathbf{U}\infty)\}$ , a virtual expression of intrinsic metalogical principles and, thus,

Metatheorem F:  $\exists \{\{\mathbf{U}\infty\} \cup \{P_{ml}\}\} \therefore \{\{\wp(\mathbf{U}\infty)\wp(\mathbf{U}\infty)\} \in \{\mathbf{U}\infty\}\} \subseteq \text{Metatheorem F} = 1$

In other words, because being's metalogical principles of **a)** actuality, **b)** creativity, **c)** integrity, **d)** infinity, **e)** relativity, **f)** dimensionality, **g)** possibility, **h)** virtuality and **i)** mentality exist, they enable numbers and countless other expressions or reflections of universal potentials, including valid metalogical tautologies. Hence, metatheorem F's validity implies and includes its own reality and proof, which proves validity of meta-tautologies of valid metatheory. So, letting 1 equal the unity of truth and reality, the metatheorem confirms itself and metatheorems A, B, C, D, and E. Of course, that resolves **CP** and verifies proof of **RH** per holonomic metamaths. In much the same way, Russell's paradox (**RP**) is also resolvable with holonomic metamaths. For, clearly, like **CP** and **RH**, the deficient logic of **RP** is caused by deficient semantics and inadequate metatheory.

In fact, the metalogical principles enabling and expressed in the preceding metatheorems and  $\{\{\mathbf{U}\infty\} \cup \{P_{ml}\}\}$  expose the cause of Russell's semantical paradox. They also enable and prove the underlying structural integrity of maths, logic, actuality, reducibility, irreducible identities, and functionalities necessary for metatheoretic proofs (of **RP**, **RH**, etc.). Still, normalized mass-confusion and systemic corruption could temporarily maintain the disintegrated paradigm of nonholonomic metamaths. Therefore, a brief analysis and remedial critique of illogical set theoretic notions, assumptions, and errors follows, below.

Holonomic set theory, etc.

As proved above, the real problem at the root of **RH** was solved with truly realistic, holonomic metatheorems. The integral proofs with valid metatheory of sets show how and why  $\mathfrak{R}_i$  and **RH** exist and do what they do (revealing the nature of the ensembles of logical and metalogical principles (enabling the results). The deficient set theoretic patchwork of defective metamaths provided more illogical obstacles than steppingstones. Therefore, it did not and could not enable the understanding sufficient to prove or disprove **RH**.

So, resolving the defects and dissolving the obstructions requires a preliminary upgrade of set theory with remedial metatheory. However, beware, modern metamaths was too difficult even for its famous pioneers. Eventually, like Riemann, when they reached the limit of their ability to think of a real solution, they quit trying. Of course, part of the reason was the specialized terms and symbology having no self-evident relation to the definitions.

Another difficult part of the problem is that, like science, maths and its metatheory are unfinished works-in-progress. Their progress is always limited by current knowledge and ideas embedded in brains and the domain of discourse and its paradigm. Like us, they are subject to imperfections and deficiencies.

That core-level difficulty caused and continually aggravates the suboptimal teaching of maths and science (etc.). Thus, it is no wonder that interest in maths and learning it is limited, even

among its teachers and gifted specialists. Also, since modern maths is thought to be based on modern set theory (MST), this article on sets and holonomic set theory (HST) is intended and offered as a steppingstone to a new era of maths and teaching it. The following redefinition may offer the best start.

**Set:** Despite many valid uses, in mathematics (maths) and some other domains of ‘Western’ philosophy and formal logic, the definition of “set” in modern set theory (MST) limits the concept with other limited concepts and rules. The limits are based on deficient knowledge and specious reasoning, claims and ideas that seem plausible, but are false or defective.

So, being based on the modern definition of sets and MST, the modern metatheory of maths and proof are deficient. For example, the current notions assume that “sets” are collections of things that ‘belong’ together or are somehow related. So, Georg Cantor and his successors decided to make the concept more general and more abstract. Yet, they thought that defining and conceiving of sets is a matter of choice, our mental collecting together “well-determined” objects of thought or perception into distinct groups and sets of sets.

There was no recognition or formal consideration and inclusion of theoretical definitions of actual metalogical principles of being and reality. Then, that—and MST’s Axiom of Choice and/or selectability (ACS)—enabled all successive and subsequently arbitrary axioms and systems of ideas, terms, definitions, theorems, and rules of maths and MST. That situation has persisted, regardless of permitting illogical contradictions and incompatibilities with natural reality and sanity. That truth is made obvious by MST’s claims and beliefs about the empty set and nothingness (explained later, below).

Now, in holonomic set theory (HST), a “set” is defined as a mental phenomenon, a concept referring to an object of consciousness, or as a grouping of other phenomena. However, HST is logically consistent and compatible with actuality, reality, and the holonomic metatheory of maths (metamaths). For example, per HST, each phenomenon (whether physical or virtual) is considered naturally real. Hence, HST accepts the form, structure, functionality, and operative potentials of all phenomena as expressions of enabling principles of being. HST also recognizes principles that enable and sustain phenomena as inseparably intrinsic to their embodiments or expressions (things, processes, events, beings, etc.). Clearly, principles determine the elements and/or constituent parts, properties, qualities, traits, and potentials of things, including other principles. Thus, the nature and unique characteristics of every individual object, group, and set—even elements of artificial logics—must be enabled and sustained by metalogical principles of reality, the cosmos. That truth enables the metatheory and logical integrity of HST.

For instance, think of “set  $S$  of all sets  $S$  that are not elements of themselves” as an actual ensemble of ideas, words, and symbolic phenomena. That was allowed by Cantor’s original rules. Now, per HST,  $S = S$  enabled and governed by the principles it expresses. Yet, Bertrand Russell saw  $S = S$  permitting a self-contradicting logical paradox, making it impossible, untrue.

However, for HST,  $S = S \equiv S_i = S_n$  and  $S$  can be a super-set of universal reality  $\{U_R\}$ , with subsets  $S_n$  (not members of themselves). So, then  $S_n = S - i$  must mean that  $S_n$  and  $S$  are strictly equivalent, and that  $S$  is metalogically bivalent. For example,  $i$  can represent an identity or an ensemble of real phenomena (organs, cells, DNA, truths, etc.); and  $S_n$  can represent phenomena that exist because of the nature and potentials of  $S_i$  yet be illusory, unreal. Thus, in that case, as containers of existential phenomena that are both real and unreal,  $S \equiv S_i = S_n$  is true. ■

That definition and proof make Cantor's idea a reality. For example,  $S_i$  can symbolize human lives, minds, and societies. So, if  $S_n$  is the subsets of  $U_R$  that include all our delusions, invalid notions, insane beliefs, false advertising, mistaken opinions, and stupidity, then they ( $S_n$ ) do not contain their contents because they are logically unreal. Also, though not identical (because of us),  $S_i$  and  $S_n$  are inseparable, metalogically equal, logically interdependent sets. We are the living proof. QED.

Clearly, MST was plagued by confusing notions about reality, logic, principles, concepts, rules, and axioms. So, it maintains deficient notions and axioms. First, while ignoring reality, Cantor and his successors thought of their notions, axioms, and rules as if they were principles. Thus, they kept ignoring the nature of real principles. So, then, MST's Axiom of Extensionality (AE) makes 2 sets having the same extent (or quantity) identical and/or equal, even when their actual constituents are not identical sets of objects or values. That is no problem in MST and HST.

Yet For example, per MST rules, the AE only works if a set of objects and their actual identities or values are thought of as equally valid examples of a single class or type, like numbers or symbols or animals, egos, etc. That limited the generality, viability, and usefulness of the AE rule and MST. Yet, illogically, supporters of MST believe that the deficient hypothesis of construction (HC) is a principle, invalidating MST and its believers. For, the HC is an accepted rule (enabled by real principles), based only on the claim that its restricted, restrictive, arbitrary (and repressive) types of concepts can define sets.

For example, the MST's system of axioms and rules only allow use of symbols representing objects, logical terms, and membership (or its absence) defined in its system of rules. Thus, while its supporters ignore **GIT**, MST was and is limited to less than fully realistic applicability and usefulness. On the other hand, HST accepts the actual universe, its reality, its nature (its elemental enabling principles, properties, and qualities) as necessary and sufficient to support valid metatheory, theory, and use (in maths, etc.). So, HST enables better qualitative analysis and truly realistic results.

MST requires a Continuum Hypothesis (CH) and an upgraded Axiom of Constructability (AC), excusing MST's arbitrarily limiting rules and assumptions. That made them seem acceptable in Gödel's constructible universe (CU) of rules and limits. However, the HC is still disputable, and the AC is considered sufficiently well-proven yet, obviously, mostly unknown or ignored. Yet, the ACS, HC, and AC are neither necessary (in actual reality) nor sufficient for set theory with completely logical integrity, optimum definability, provability, ideal explicability, and fully effective teachability.

For example, if we accept pre-existent reality (of being) and its enabling principles, then we can accept the existence of all sets, whether (or not) anyone chooses to select one, or several elements of several sets. If we accept the reality of possible phenomena, then we can accept the existence of the ongoing moment of universal being as the actual continuum of being (as a self-evident, self-verifying reality). If we accept the pre-existent reality of the continuum of universal being, then we can prove and accept the existence and reliability of valid logic, maths, and sets.

Artificial, arbitrary, self-limiting rules of construction are then unnecessary. If all self-evident realities and theorems of HST are truly real, then we can also accept the infinities of universal phenomena and potentials. However, the existence of infinite sets is recognized and accepted for use in MST, but with limited usefulness. For example, MST accepts an unnecessarily limiting Axiom of Infinity ( $A^\infty$ ). Yet, MST's  $A^\infty$  says only that there must be at least 1 infinite set, normally considered the 'natural' numbers. It does not explain why we should doubt the reality and definability of an actual infinity of natural, actual, and virtual infinities.

Early MST actually fostered neglect of actual infinities and other realities that were 'difficult' to define or use (with its antique ideas, methods, and opinions). So, the notions, rules, and illogic that limit MST's definitions invalidate the whole basis of its system of concepts. The ACS (axiom of choice/selection) proves that.

The ACS is thought to be an essential necessity of sets and set theory, only because functionality (the principle) was not fully understood. So, ACS's function was invented, and its theorem seemed to justify the existence and uses of sets (in maths, symbolic logic, etc.). Also, since MST came to be considered the core of the foundational metatheory of all maths and logic, the ACS came to be accepted as necessarily sufficient. So, despite intrinsic illogic, the ACS supports countless projects and arguments of exotic maths. However, contrary to some opinions, it is not only unlike Euclid's apparently arbitrary axiom for parallel lines, but simply wrong.

There is much more extensive disproof, yet a simple example shows the MST's illogic: Per the  $A^\infty$  and ACS of MST:

“If  $\mathbf{S}$  is a system without empty sets...set  $A$  has only 1 element in common with every set  $S$  of  $\mathbf{S}$ .”

Yet, per HST's metatheory, we can see and realistically define all sets  $S$  of  $\mathbf{S}$  with more than 1 element in common. For example, all real phenomena—including energy and energetic elements—are actual embodiments and/or expressions of enabling, sustaining principles of being. They can also be represented as intrinsic elements of sets  $S$  of  $\mathbf{S}$ .

So, all compound phenomena and systems can be represented as subsets  $\{S\}$  of  $\{\mathbf{S}\}$  of super-set  $\{\mathbf{U}_R^\infty\}$ , universal reality's infinities. Therefore, since  $\{\mathbf{U}_R^\infty\}$  contains all existing phenomena, including the principles enabling and sustaining all things (including principles), all actual and virtual ensembles and sets contain more than 1 element common to all sets  $S$  of  $\mathbf{S}$ .

We can be sure of that truth because the emptiness of empty sets is a concept that represents the principle; and all sets require and express intrinsic principles that enable and determine their natures, forms, structures, functionalities, and operative potentials. So,  $\{S\}$  of  $\{\mathbf{S}\}$  of universal reality is strictly equivalent to HST's meta-axiom of actual infinity,

Metatheorem G:  $\{\{\mathbf{U}_R^\infty\} \supset Aa^\infty\} \equiv \{\mathbf{U}^\infty\}$ . ■

Translation: The totality of universal reality's infinities is the super-set of all actual phenomena; and that makes them strictly equivalent to the infinite totality of universal being, the cosmos. If that is untrue, then there are no systems of sets, no elements, no identities, no names, no values,

no uses, and not much of anything or anyone else, anywhere. So, obviously, trying to disprove it would prove metatheorem G true.

So, that, and fig. 1b, prove the reliability of {N} and **RH**. QED.

Thus, clearly, the ACS and MST are not only deficient and semi-invalid, its illogically restrictive notions, definitions, axioms, and rules make it far less than ideal for fully useful maths. In fact, continuing arguments for maintaining MST 'as is' maintains defective metamaths and deficient proof theory. Naturally, that maintains the invalidity of arguments in favor of maintaining unrealistic theory and metatheory of logic and maths.

Of course, none of the above says that MST and modern proof theory are totally useless. Like the failed early works of metamaths, MST set the stage for and required all the supplementary work that kept the game going, enabling the vast bodies of useful results in type theory, class theory, category theory, etc. In fact, using some of the existing methods of MST, category theory and type theory enables formal unconditional proofs of HST. So, clearly, this metatheoretic proof of HST and RH (etc.) enables substantial progress and vast new potentials in the domains of higher maths, logic, computer science, physics, and technology. However, before moving on to the subsequent levels of proof (of **RH**, etc.), a summary update of proof theory concludes this section on the necessary metamaths.

Definability, provability, explainability, etc.

So far, at least four other investigators developed unconditional technical and even graphic, semiotic proof that **RH** is true. Yet, as far as I know now, not even Sir Michael Atiyah's "proof" satisfied the global "community" of mathematicians and the Clay Institute's prize program committee. As implied above, I don't blame them.

No previous proof or attempted proof of **RH** was fully satisfactory. For example Atiyah's paper failed to provide even reasonable certainty of validity. The others provide reasonable certainty, but not the full satisfaction of absolute certainty. The nature of  $\mathfrak{R}_\zeta$  and **RH** make the best proof and absolute certainty impossible without fully definitive explanation. For example, technical proofs that only show identical operational functionality, explain nothing about the nature of  $\mathfrak{R}_\zeta$  (and **RH**), nothing about how and why the results will always be identical.

Naturally, since  $\mathfrak{R}_\zeta$  is unique, only it can do exactly what it does in  $C_\infty$  (the complex plane). That leaves room for some doubts (about functional reliability, etc.). Also, as will be shown in following sections, a technical proof that can only show us numeric structural logic (of numbers and complex trigonometry) enabling  $\mathfrak{R}_\zeta$  fails to provide absolute certainty about those amazing zeroes, and how and why Riemann's formula could only put them on that line (at  $\text{Re}+ = 1/2$ ), forever. So, clearly, perfect proof of **RH** requires integral metatheory congruent with enabling principles and meta-axioms of holonomic proof theory. Nothing less can provide absolute proof of **RH** with optimum (definitive, comprehensive) explanation and absolute certainty, for the best possible satisfaction.

So, though a good proof, like good theory, offers satisfaction and reasonable certainty, it falls short of the standard required by **RH**. It requires the best possible proof, the result of a holistic, ontological, axiological, teleological approach that integrates all the relevant metalogical facts. Put more simply, for full satisfaction and trust, a perfect proof of **RH** must let us understand the nature of  $\mathfrak{R}_\zeta$  and exactly how and why it does what it does, and only does it that way, reliably. So, the next section deals mainly with the formal/morphic principles that enable numbers, arithmetic, trigonometry, analytic geometry, and  $\mathfrak{R}_\zeta$  (and its structural, functional, operational, and semiotic, potentials and results).

## 2.2 Metamorphology

“No other question has ever moved so profoundly the spirit of man; no other idea has so fruitfully stimulated his intellect; yet no other concept stands in greater need of clarification than that of the infinite.” – David Hilbert

Trying to solve the **RH** problem without fully understanding infinity and the principles that enable them (and  $\mathfrak{R}_\zeta$ ) is a waste of time and opportunity. The previous section dealt with the basic metalogical principles that enable proof, in general. Dealing with the specific enabling principles intrinsic to  $\mathfrak{R}_\zeta$  and **RH** may as well start with the logical and metalogical principles of form. After all, no form, no structure, no function, no visibility or knowability.

So, assuming that the definitions of number, symbol, form, and the other enabling principles are known, this section proves **RH** true by showing how and why (using  $1/2$  and real roots of unity)  $\mathfrak{R}_\zeta$  can put symbolic zeroes only on the line of symmetry and (if possible) at every  $-2n$ . Yet, bear in mind that, literally, the key issues and principles revolve around primality, symmetry, symbolic values, and the infinities enabling and expressed with and by  $\mathfrak{R}_\zeta$  and its key results.

However, the results of mapping **N**, shown in Fig. 1b, prove the infinitely reliable constancy of the numeric logic of numbers and maths,  $\{\mathbf{N}\}$ , and the principles of form and semiotics.

It also proves the deficiency of modern linguistics a major cause of the **RH** problem. It can also be seen in nonsense deceptively conflating “metamorphosis” as a label for change. Obviously, the accurate scientific label for change is either “transmorphosis” or transformation. Clearly, the importance of semantics to understanding **RH** and  $\mathfrak{R}_\zeta$  cannot be over-estimated.

For example, clearly, the real value of the results of mapping  $\mathfrak{R}_\zeta$  (with  $s = 1/2$ ) was and still is its demonstration of the relationship of **a**) primality, unity, and nonprimal values, **b**) discrete and continuous values, **c**) definite quantities and infinity, **d**) approximation and actual realities, and **e**) the symmetry and asymmetries of numeric logic and its enabling metalogical principles. Also recall that, as proved above & below, Riemann’s purpose and reasons for developing and using  $\mathfrak{R}_\zeta$  were based on his limited interests and ideas (about numbers, maths, infinity, etc.). Thus, this work may also prove Hilbert wrong about “the spirit of man”. Questions of reality and certainty seem far more deeply motivating for most of us.

Yet, the question, “what is the form of infinity?” is a necessity.

Riemann, among many others before and after him, clearly missed that. However, it relates directly to the real form of a number, or a principle, or a construct of maths, like formality, the artificial principle enabling formal proofs. The answers help us recognize proof of **RH**. For those those questions, answers, and the implications involve issues directly related to **RH** and  $\mathfrak{R}_z$  (and its integral numeric and semiotic logic). That is so, because logical and metalogical principles of form enabling  $\mathfrak{R}_z$  are essential for understanding it and **RH**, and proving it.

Naturally, the principles enabling the form, structure, functioning, and results of  $\mathfrak{R}_z$  (using any inputs) are interdependent ensembles (subsets) of the logical and metalogical principles that enable all of maths and reality. Therefore, we can best understand how the nature of its form enables the potentials and results of using  $\mathfrak{R}_z$  (with  $s = 1/2$ ) by discovering how the principles enabling the forms of its logical elements and functions affect it.

Work can start by looking to the morphic-numeric logic of the numbers that let  $\mathfrak{R}_z$  put zeroes where it puts them when  $s$  (“the real part”) is  $1/2$ ; or we could start by investigating the forms integral to the rules, axioms, and logical principles that enable a) the zeta function, b) complex arithmetic, c) “imaginary” numbers, d) the complex plane, e) Riemannian geometry, and f) the results (of using  $\mathfrak{R}_z$  with  $s = 1/2$ ). We could start with the integral metalogical principles that enable the subsidiary principles that enable the operation of  $\mathfrak{R}_z$  and its results. Yet, it seems best to start with the forms of the numeric inputs, the numbers, and numeric logic.

For example, analyzing the relevant logic of form can begin with the numbers that caused and enable **RH** (mainly  $i$ ,  $1/2$ ,  $1$ ,  $0$ , and  $-2n$ ). Naturally,  $-2n$  is included because it represents the negative primality, relativity, symmetry, duality, and reciprocity enabling  $\mathfrak{R}_z$  and its results (at  $1/2$ ). Yet, numeric forms and values (etc.) are only actual when we express them on paper or digital displays, or when we record them somehow.

For example, in figure 1, a & b, above, graphic forms exhibit semiotic potentials of the numeric logic enabling the natural whole numbers ( $n$  of  $\mathbf{N}$ ). Naturally, the nature of form requires structure. So, figure 1 also reveals the interdependence of the principles of form and structure, and how they enable the potentials of numbers, graphs, maps, and the semiotics that enable  $\mathfrak{R}_z$  and its results. With that in mind, we can extensively analyze the symbolic qualities and potentials of the forms most essential to **RH** and  $\mathfrak{R}_z$  and understanding:

0. 0 represents primal nothingness or absence of value, and neutrality or infinity
1. 1 represents oneness, unity, individuality, identity, and positive unitary value
2.  $1/2$  represents halfness, the fractional value of unity divided by duality
3.  $\mathbf{C}_\infty$  represents the complex plane, the nōetic domain of virtual numbers (wrongly called “imaginary”), complex forms, relations, etc.
4.  $i$  represents and expresses the relations of primal exponential expansion, enabling the structural logic of  $\mathbf{C}_\infty$  and square geometry and locations in  $\mathbf{C}_\infty$  (for analytic geometries & symbolic values), enabling meaning; and  $i^2$  represents  $-1$  (the negative complement of oneness, singularity, unity, and the integrity of identity, duality, multiplicity, and infinity)



5.  $\infty$  represents infinity, infinite value, boundless or endless multiplicity or totality, and the nature of universal wholeness
6. 4 represents the primal square, squareness, quadrinary value, fourness, and the four quadrants of the unit circle and Riemann's graph (in  $C_\infty$ )

Yes, the last 2 symbols and their meanings are not explicitly featured in  $\mathfrak{R}_\zeta$  and the results, but are implicit, intrinsic, and integral. Especially on the line at 1/2 we see their importance to  $\mathfrak{R}_\zeta$  and proof of **RH**. As shown below, the nature and meaning of each preceding form confirms that. Of course, we could say the same of variables  $s$  and  $t$  and the symbols for the functional operators, even of the semiotic forms (points, curves, lines, etc.) of the graphs (that make  $\mathfrak{R}_\zeta$  possible and visible). Yet, the 7 symbolic forms listed are keys to understanding the deeper levels of logical and metalogical principles, meanings, functions, and relations enabling and embedded in  $\mathfrak{R}_\zeta$  and expressed by it.

Of course, all other forms and symbols of the maths and semiotics intrinsic to and necessary for  $\mathfrak{R}_\zeta$  are representative of well-defined elements of maths and its semiotics. Yet, on their own, they tell us nothing new about  $\mathfrak{R}_\zeta$  and **RH**, nor about the principles enabling them and the holonomic metatheory we need for absolute proof. However, understanding  $\mathfrak{R}_\zeta$  and **RH** makes understanding the 7 primal keys (to the enabling logic and metalogical principles) an essential necessity.

Now, those 7 key symbols were not cherry picked to coincide with the last primitive primal. All the forms, structural qualities, and functional potentials of the numeric logic of primitive primal numbers are directly related to the nature of a) the **RH** problem, b) its solution, and c) maths, metamaths, and the metalogical elements of  $\mathfrak{R}_\zeta$  and proof. Indeed, the first decan of  $S_N$  provides abundant clues and proofs of the intrinsic numeric logic of the whole field of **N**.

For example, expressions of primality, its logical and metalogical integrity—and its intimate relationships with duality, multiplicity, totality, numeric logic, the rest of **N**'s whole numbers, and their identities, properties, and potentials—are interdependent, interrelated, intrinsically. That makes every numeric relationship integral to  $\mathfrak{R}_\zeta$  and its results relevant to our analysis of it and, thus, to perfect proof or disproof of **RH** (or similar hypotheses). For instance, consider the numbers and numeric values central to **RH**. Like all numbers, they are symbolic, abstract, purely mental constructs. Yet, they directly relate to and represent quantities and/or measures. Obviously, we can also relate numeric symbols and concepts to semiotic expressions of functionality, mathematical operations, or anything else we want them to symbolize.

So, all numbers and their symbolic values are both virtual and actual objects of consciousness. We use them to relate with other objects, concepts, and actualities—for an infinite variety of other uses and purposes. Each number or its symbol has infinite potentials for representing something else. Thus, a number's form has finite yet virtual conceptual, transfinite symbolic potential, and infinite relativity (actual relational potentials).

Now, for analyzing the numeric logic of  $\mathfrak{R}_\zeta$  and the 7 key symbols critical for understanding it, consider the following expressions and effects of logical and metalogical causes:

First, for all the reasons given above & below, primality is essential to  $\mathfrak{R}_z$  and **RH**. That makes the forms of unity and 1 (and their enabling metalogical principles) equally relevant. So, since squaring its imaginary root equals  $-1$ , both  $i$  and exponentiation are essential to  $\mathfrak{R}_z$  (and Riemann's map in  $C_\infty$ ). Thus, the numeric logic enabling squares and values of the power of 2 are relevant. So, even 4 expresses primality as the first square of 2's dyadic primality, making it the 1<sup>st</sup> bi-primal number, and 1<sup>st</sup> expressing squareness, tetrality, and quadrinity. So, the primary primitive numeric quad is (0,1,2,3) and, thus, the primal tetral set is {0,1,2,3}. This lets us see more of the numeric logic and forms expressed as and by 2ness, expressing its primal duality. Of course, 2 and duality only exist in relation to unity and 1ness, which can be seen in the relativity of 0 and 1. So, we can see how and why 0, 1, and 2 are essential elements of the numeric logic, forms, symmetry, and metalogical asymmetries enabling  $\mathfrak{R}_z$  and the zeroes on the line of symmetry.

Indeed, the duality and logical asymmetry of 0 and 1 cause and define the boundaries of Riemann's critical strip (in  $C_\infty$ ). In fact, 0 (zero) is neutral, not valueless; and its only logical numeric equivalent in  $C_\infty$  is  $(1(+\infty) + 1(-\infty)) = \infty$  (infinity). So, since 0 is the primary integer, and can be divided by 0, and its own value is only real factor, 0 is a form of primality. So, its logical equivalence with 1 and unity is shown by its use as an exponent, when  $n^0 = 1n$ , also in expressing the dyadic relativity of presence and absence or on and off (etc.). More importantly (for  $\mathfrak{R}_z$  and **RH**)—being the neutral origin of Re+ and Re— and the line of symmetry between the negative and positive upper quadrants of  $C_\infty$  and Riemann's graph—only 0 enables the asymmetry that makes 1 the other side of the critical strip.

In this very special case, that is so because the finite nature of the perfectly convergent results of graphing the line at  $\text{Re}+ = 1$  exhibits the complementary metalogical symmetry of unity primality, the principles, and of duality. They enable the relativity of 1 and 0, and of 1/2 and  $-2$ , and  $-2n$ , the asymmetrical reflections of the 0s on the line at 1/2. Hence, that line and the relevant forms (on in  $C_\infty$ ) really do make it the line of metalogical symmetry. We also see that in the virtual forms on both sides of the line at 1/2. Symbolically, the other fractions of greater and lesser values logically reflect the symmetry the symmetry of the positive and negative integers. For example,  $+n$  and  $-n$  are perfectly symmetrical mates, numerically and logically. Yet, there are no numerically balanced, complementary fractions at any point on  $\text{Re}+ = 1/2$  or on  $\text{Re}+ > 1/2 < 1$ . So, that reflects the asymmetry of primal and nonprimal values.

The rest of the poof builds on this foundation. Yet, clearly, **RH** depends on the key issues addressed above. Also, the metalogical principles enabling and sustaining, forms, functions,  $\mathfrak{R}_z$  (and  $C_\infty$ ), numbers, and maths are changeless. So, we can rely on  $\mathfrak{R}_z$  and maths to do what they do, because the enabling logic and potentials of their forms are reliable.

The infinite line of symmetry—evenly dividing the complex strip between 0 and 1—provides visible, graphic, semiotic, and logical proof of that truth of metamaths. Also, recall that Riemann's infinite sum requires ongoing division of 1 (primal unity) and complex addition, with intrinsic multiplication by  $i$ .

All those forms and operations express the meta-dyadic roots of primal complexity and bivalent identity/primality. Why? The nature of  $\mathfrak{R}_z$  keeps putting symbolic zeroes only where

it does because of the interdependence of its nature (the forms, rules, and enabling principles) and the nature of its inputs (the numbers and values), their enabling principles. The morphology, structural logic, and functional potentials of the totality of  $n$  (of  $\mathbf{N}$  and  $\text{Re}+$ ) are ruled by the primal nature of numeric logic and its enabling metalogical principles, not flukes.

More briefly, numbers and the operational functionality of  $\mathfrak{R}_z$  are ruled by principles that determine the limits of their potentials. In other words, the semiotics of maths express the interdependent possibilities of numbers and the forms and structures of the terms, expressions, functions, equations, and operations that use them.

So, in fig. 1 above (the maps of  $\mathbf{N}$ ), intrinsic numeric logic enables bisecting the graphs with a  $45^\circ$  diagonal line (sloping at a 1:1 ratio), from zero through the lower right corners of each number's square (above the bisector). A line through the upper right corners of all the squares, slopes at a 2:1 ratio; and a line through the centers of all the numbers' squares, slopes at a 3:1 ratio. Obviously, the horizontal line from zero to  $n + 1 \dots \rightarrow \infty$  indicates positive numeric values and magnitudes, and the vertical line at zero enables reflection of numeric identity, cardinality, and ordinality.

Both those graphs, even in rough draft form, give visible proof of the semiotics, form, and structure of numeric logic enabling the numbers, relationships, ratios, and mapping. There is clearly no possible principle or property of numeric or semiotic logic that could cause any other possibilities or change of those facts. The numbers' successive squares are also the only forms that enable such a clear view of the field, its nature, principles, relations, potentials, and the locations of all the composite multiples and primal values of  $\mathbf{S}_N \rightarrow +\infty$  or in  $(x_+, y_+)$  in Q.I of  $C_U$  (the unit circle of trig.) and above  $\text{Re}+$  of  $C_\infty$  (the complex plane). So, doubting these facts of numeric logic and metamorphology would be as illogical as doubting the reliability of  $\pi$  (pi, 3.141...) and  $\Phi$  (Phi, the Golden Ratio) or  $e$ . Likewise, doubting the nature and results of  $\mathfrak{R}_z$  when  $(s) = 1/2$  would be equally illogical.

Thus, the truth of **RH** is morphologically verified. QED.

For, clearly, the graphs of  $\mathbf{N}$  (in Fig. 1) visibly prove that the semiotics embody and express the principles of numeric logic and the enabling metalogical principles of form, structure, functionality, primal unity, relativity, complexity, and maths. Figure 1 proves the reality and nature of the principles and semiotics required to communicate anything about numbers and maths. Thus, orthogonal mappings of  $\mathbf{N}$  clearly help us see some of the reality, validity, and value of metamaths.

You could falsify those metatheorems, but not without foolishness. Yet, to disprove **RH** only requires 1 exception,  $\mathfrak{R}_z$  putting just 1 zero off the symbolic line at  $1/2$ , but with proof of why. Proving **RH** true requires just 1 good reliable explanation of why  $\mathfrak{R}_z$  can put symbolic zeroes only on the symbolic lines in its graph. More certainty is enabled and supported in the sections on the structural and functional logic enabling  $\mathfrak{R}_z$  and proof of **RH**.

NOTE: Clearly, Fig. 1 a& b also prove that precisely locating colossal primals can be achieved by graphing in any segment of interest (in  $S_N \rightarrow +\infty$ ) beyond hyper-composites, such as those likely to include primal couplets. That can be expedited by using techniques and formulas related to the prime number theorem and stratagems implied in other subsections (and in proof of the **TPC**, in subsection 2.8).

However, we can enjoy more certainty of these results after considering the core truths in a summary of relevant facts:

Nature's creativity has consistently produced the macro-event we call the universe, as is, for an inconceivably long sequence of moments. Its current principles of being and enabling metalogical principles create no signs of dissatisfaction with nature's current set of principles. It seems safe then to trust the principles and habits that got universal totality to its present moment of being. Evidently, being's existing nature is also sufficient for further existence, for far longer than our species will exist.

Clearly, reliable metalogical principles enable and rule the whole numbers of numeric symbolism. So, no matter how vast the magnitudes, reliable principles enable the nature, form, structure, functionality, identity, complexity, and semiotic potentials of every number. Thus, as the values of huge nonprimal numbers grow, so does the complexity of their composition.

For example, however huge a hyper-composite number gets, its potential for factorability with primals increases in direct proportion to its hyper-complexity. Also, no matter how hyper-huge, the morphological principles of the nonprimal natural numbers gives them and their multiples their intrinsic symmetrical qualities, properties, and potentials. Yet, if we could produce nonprimal numbers forever, their geometric and numerical symmetries would be impossible and meaningless without asymmetry and the primals.

If we could compute the number line  $\mathbf{N}+$  to eternity, we would still see that, as the quantity and frequency of primal numbers decrease (as  $S_N \rightarrow +\infty$ ), their integral structural complexity increases, proportionally. So, the numeral sequences, displaying intrinsic reflections of various explicate symmetries, would increase proportionally (as their sizes and quantities increase). Also, as the quantities and values of  $n$  increase, still, exponential values and their quantities conform to the Power Law. It ensures proportional relative increase of composite complexity and factorability.

Would we see that confirmed if we could continue  $\mathfrak{R}_z$  and the line of symmetry (at 1/2) forever?

In principle, that cuts to the real root of **RH**. Now, recall that Newton saw that, in principle, nature likes a reliable foundation of logic, to sustain the boundless complexity of her universal creation with the greatest simplicity. Newton and Mark Twain also realized that nature loves logical simplicity with endless persistence. Thus, after nearly 3,000 years, Euclid's proof of primal infinitude holds as true as the Right Angle Theorem. Clearly—being naturally primal and elementary--primal nature, being's enabling metalogical principles, remain constant (and valid functions of maths remain reliable).

Again, the **NDR** stands as self-evident proof of the natural metalogical principles that enable maths and other real phenomena and their relativity. Still, despite the nature and logic of forms, doubt and suspicion are understandable and tenacious. After all, some functions of maths cause unexpected results that are not proportionally relative; and not all phenomena accord with the **NDR** (making it helpful for detecting cheats and fraud).

So, it may now help to recall the potency of **a)** symbolic values and forms, and **b)** the principles enabling semiotics and symbolic forms.

For example, the reliability of the fundamental principles ruling maths, symbolic forms, and semiotics—enabling the Möbius Function, the Ramanujan Sum,  $\mathfrak{R}_\zeta$  and other exotic wonders—also ensure the reliability of the intrinsic regularity enabling all functions and formulas of maths and of the **NDR**. Thus, again, metamorphology shows that **RH** is true. QED.

Therefore, unlike some functional operations, the way  $\mathfrak{R}_\zeta$  works is reliable. Its form, properties, and potentials cannot change without changing the enabling principles that rule and sustain it. They cannot change without changing the meanings of the definitions of terms enabling  $\mathfrak{R}_\zeta$  and its logical subfunctions. Changing any enabling principles of the relevant maths would change the meaning and potentials of the expressions, terms, and potentials of  $\mathfrak{R}_\zeta$  (and the forms expressing its integral logic). The same is true of all numbers and numeric logic itself.

If possible, any exception or inherent transience would make logic and maths meaningless, totally unreliable, and impossible. That would make  $\mathfrak{R}_\zeta$  and **RH** impossible.

With a more expansive explanation, we can now see why **RH** is absolutely true. First, recall that using  $\mathfrak{R}_\zeta$  to graph the zeroes at the line of symmetry is a very special case, producing a unique result. Its unique form represents a very special relationship, of primality and relativity, also of the relativity of discrete and continuous forms of symbolic and numeric identity. So, additive progression lets  $\mathfrak{R}_\zeta$  create an infinite sum of complex fractions. Each of those fractions is a reciprocal added to the previous instance (of **1** divided by an exponential expression of unity plus a complex denominator raised to the power of  $-s$ ). So, each reciprocal's denominator is composed of the sum of a positive operative value (the “imaginary” value) multiplied by another special value. So, when the critical “real” value is  $1/2$ , then and only then does  $\mathfrak{R}_\zeta$  reveal and confirm the nature of the relativities expressed, symbolically, graphically, per the enabling principles of form (etc.).

Naturally, it helps to recall Ramanujan's Sum and his revelations of “the  $n^{\text{th}}$  roots of unity”. Neither he nor Möbius were indulging in shallow sophistry. Unity is a primordial principle and the actual basis of identity and universal reality, also the most primal characteristic of existence and identity. So, numbers, symbols, mathematical functions, and operations enable descriptive statements about forms of being and identities, symbolizing their potentials and possibilities.

In other words, Riemann stumbled into an elegant expression of the inseparability of **a)** unity and duality, **b)** totality and infinity, and **c)** the primality of nature's metalogical principles.

Fortunately, nature’s metallic will not and cannot change unless or until the super-ancient nature and ways of the universe change.

Finally, despite obsessive fascination with the ability to predict and closely track the quantity and distribution of primal numbers with Riemann’s corrected density function ( $D_{Pc}$ ), no matter how small the percentage of inherent error, the map is not the territory. Riemann’s  $D_{Pc}$  only produces probabilistic results, approximations, not exact, discreet locations of ‘real’ numbers. So, compared to  $\Re_{\zeta}$  and its results, Riemann’s  $D_{Pc}$  and similar functions and results (and their operational potentials) are merely trivial play things.

More examples of the potentials of mathematical logic and its enabling principles will be more thoroughly proven in the following subsections. However, fig. 2, below, lets us see more of the interdependence of primal form, structure, functionality, and semiotics:

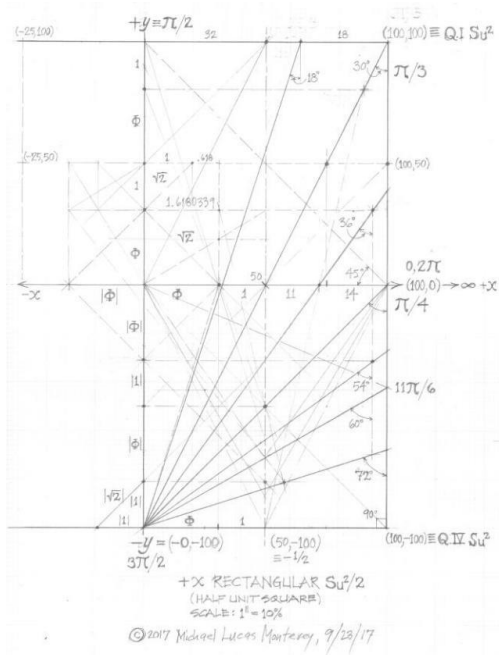


Fig. 2. Golden Ratio & percentages, re: Q.I & Q.IV of  $U_S/2$

## 2.4 Structural logic

“One can measure the importance of a scientific work by the number of earlier publications rendered superfluous by it.” – David Hilbert

Figures 1 and 2, above, clearly prove that Hilbert was right again. The importance of this paper is visibly proved by its exposure and correction of the deficiencies of all preceding publications (on RH and the P/NP problem, etc.). In fact, they obscured the key issues and principles.

Indeed, RH is mostly about forms, formalities, semiotics, relations, symmetry, asymmetry, and relativity, among other things. That made structural principles key elements essential to the understanding and proof of RH. For example, at  $-2n$  of Re- and on  $1/2$  of Re+,  $\Re_{\zeta}$  reflects the

complementary relativity of primality and numeric complexity. It also shows that form and structure are inseparably interdependent. Otherwise, maths and the cosmos might be a completely impossible, disorderly mish-mash of roiling nonsense.

Figures 1 and 2 also prove that intrinsic metalogical principles of numeric and geometric logic enable the permanent constancy of numeric logic, numbers, arithmetic, Euclidean geometry, trigonometry, analytic continuation of complex algebraic geometry, and the results of  $\mathfrak{R}_\zeta$  (in  $C_\infty$ ). Obviously, they also prove the **POP** and **NDR**.

The principle of permanence (**POP**) and nature's distribution rule (**NDR**) also express the intrinsic permanence and regularity of universal structural principles. They enable semiotics and the visibility of numeric logic with graphics.

Clearly, no form, no structure. Yet, the simplest form has structure, however subtle or virtual. The nature of structure is enabled by intrinsic metalogical principles that determine its nature, its functionality, and all its potentials. These facts, implications, and the possibilities are more important than all the other papers they make obsolete.

For example, both the **POP** and **NDR** support those truths. Yet, it seems that Hilbert and Gödel (among others) never asked how or why structural principles exist. Apparently, Riemann never bothered to wonder about the structural nature of maths. Of course, understanding required previously absent metatheory and knowledge of essential principles, the metalogical principles of universal being.

Yet, being is clearly the source, basis, and enabling meta-domain of all systemic logics. Thus, structural integrity, regularity, constancy, permanence, functionality, viability, and durability—of maths and  $\mathfrak{R}_\zeta$ —are enabled by the immutable principles of nature. So, holonomic ontology lets us get into the heart and structural roots of **RH**, metamaths, and holonomic proof theory.

With the simplicity enabling complexity we can untangle the inscrutable conundrums of exotic maths and matter approximated by  $\mathfrak{R}_\zeta$  (and the numeric logic of  $1/2$ ) and see why. However, it helps to remember that time is a purely mental illusion; also that spatiality, dimensionality, physicality, and mentality are all principles. They all exist in and because of the nonmaterial infinity of life's noösphere—nature's meta-realm of metalogical principles, intelligence, intellect, meaning, and thought.

The noösphere enables life's universal tendency to create new forms of being and intelligence, usually using DNA-RNA as its AI (actual intelligence) metadata agency, to rule its biophysical creations. Likewise, the nondual metamorphic structural logic ruling  $\mathfrak{R}_\zeta$  and **N+** also enables and sustains being's other structural possibilities and functional potentials.

So, although the structure of a number (or maths) may seem inscrutable or elusive, it is no more so than any other structure of a form or function of a system or a rule (or any other thing). We can see the most elemental embodiment and expression of structure in geometric forms and polygonal numbers. That may be the reason for Euclid giving his book on geometry and maths its title, *Elements*. Mapping **N+** reveals the structural logic of numbers.

Maps and trigonometric graphs let us see the interdependent structure of maths and numeric logic. So, we see nondual numeric-geometric structural logic in the Fibonacci series, the Golden Ratio, Golden Spirals, Golden Rectangles, Golden Triangles, pentagrams, the Unit Circle, the complex plane, and countless other mathematical forms. In Erickson's graphs<sup>[2]</sup> of  $\mathfrak{R}_z$  and "Ulam spirals" we see incontestable graphical evidence of the structural logic of maths in general, in numbers, arithmetic, and geometry—reflected or implied in Riemannian geometry and complex trigonometry.

As we can see (after absorbing all the logical and metalogical basics), Euclid's proof of primal infinitude partially supports that metatheorem, indirectly. However, on its own, it fails to help us understand the deep structure of maths and numeral logic we need to be sure about **RH**. The same is true of **GIT** (Godel's incompleteness theorem), the **POP** and **NDR**. Yet, as proved here and below, they support this complex proof and metaproof by enabling our understanding that nature's structural principles enable and sustain the realities and potentials of maths and numbers.

So, we should accept visible facts. For example, virtually identical curves can be produced with modern algorithms for graphing the distribution density of primals  $n_p < \mathbf{N} \approx \infty$  and with Riemann's zeros at  $+1/2$ . The relations of enabling numeric and semiotic structural logic, and the ensembles of principles ruling the operations they enable guarantee that certainty.

Now, with all that in mind, we should be sure that **RH** is true if a graph shows the decreasing density of zeros (of  $\mathfrak{R}_z$  at  $1/2$ ) as an asymptotic curve proceeding toward  $n \approx +\infty$ , while closely matching the curve of the optimized density function for primal numbers less than  $n \approx \infty$ . That is a reliable fact because we can now see that there is no reason or reality that could change the principles that enable and rule the maths, numbers, and semiotics. Obviously, any mismatch of those curves as  $n + 1 \dots \rightarrow X \approx \infty$  (or in  $\mathbf{S}_N$  of  $\mathbf{N} \approx \infty$ ) could only be because of changes or differences in the mathematical mechanics of the functions used to generate the results, not differences in the structural principles enabling and governing the numbers, their nature, properties, and relations. Yet, any deviant mechanics or operation would either be impossible or simply invalidate the formulas and functions of the maths required.

Despite our mortality, even Euclid's proof of primal infinity assures us that, despite those curves approaching infinity, they can never flatten out to horizontal at  $y = 0$ . We can also be sure that the principles and mechanics of maths enabling and sustaining the structure of  $\mathfrak{R}_z$  will never change, unless the universe decides to change the nature of the principles ruling logic and maths. That impossibility should be self-evident. So, the self-evident structural logic should discourage belief in bounded nonprimal intervals of  $n_c$  (composites) being limited to a constant length, like  $\approx 70$  million intermediate nonprimals  $n_c$  between primals  $n_p$  of  $\mathbf{S}_N \rightarrow \approx \infty$ .

That impossibility is ensured by structural principles and numeric logic (cardinality, ordinality, etc.) enabling  $n_c$  and  $n_p$  that make the increasingly hyper-colossal composites ever nearer infinity asymmetrically reflected by an inverse proportional rarity of primals. That will remain provably true even if a super-computer could keep searching long after our mass-extinction.



That fact is especially relevant to  $\mathfrak{R}_\zeta$  and **RH**. Clearly though, understanding the structural principles of the maths, logic, and semiotics relevant to **RH** is easier with visual aids (3D GCI & graphs).

However, if there were no structural and meta-structural principles enabling and sustaining the relations and potentials of numbers (all  $n_c$  and  $n_p$ ), there would be no way to consistently depict and use them. Nor would there be diagonal, vertical, and horizontal patterns and lines of dots showing the varying density of  $n_p$  and powers of  $n_p$  in Ulam’s spiral maps. Hexigraphic maps show all  $n_p > 3$  in senary form (base 6) at only 2 (one 3<sup>rd</sup>) of the 6 vertices, with final (‘least significant’) digit  $d_f$  of only ...1 or ...5 (and, luckily,  $1 + 5 = 6$ ). Naturally, as mentioned above and below (re: in proof of the **TPC**), that is because all primals  $n_p > 5$  in  $S_{N \rightarrow +\infty}$  come before or after a multiple of 6.

Clearly, none of those facts are accidents or examples gratuitous grace, provided only for the sake of amazement. Nor are they trivial, insignificant flukes of an illogical universe. Senary sexiness is as significant and meaningful as 2 and 6 being the first 2 examples of “superior highly composite numbers”<sup>[?]</sup>  and of the “colossally abundant numbers”.<sup>[?]</sup>  So, it is no wonder that all senary forms of “even perfect numbers”  $6n_{pe \rightarrow \infty} > 66$  have a  $d_f$  of ...4. For proof, notice that all  $6n_{pe} = 2^{p-1}(2^p - 1)$ , where  $2^p - 1$  is a primal number,  $n_p$  (as proved by Euclid and Euler).

So, otherwise, if some illogically chaotic structural principles enabled 66 or  $6n$  (and  $6n_{pe}$ ), then even perfect numbers in mod 6 might end with a  $d_f$  other than 4, and all  $n_p > 5$  might be somewhere other than  $6n \pm 1$ . Yet, nature’s perfectly reliable metalogical principles (of being) ensure that those irregularities can never exist.

In fact, as proven (in the final section of proof) below, these and other relevant facts of numeric logic, morphic, structural and functional logic confirm the reality of the metalogical structural principles that enable and rule all primal couplets separated by  $6n$  of the form

$$n_p > 5 = (6n \pm 1) \subseteq S_{N \rightarrow \{N_{+\infty}\}} \supset n_p \rightarrow \{+\infty\}$$

Furthermore, Ramanujan seeing 2 as both the 1st ‘superior highly composite number’ and the 1st ‘colossally abundant number’ was appropriate to its metalogical nature. Its intrinsic, enabling, and sustaining principles make 2 the only number that perfectly represents primal duality and dyadic primality. For example, 2 is the 1st numeric identity expressing original division of unity by duality (and both are infinite, transfinite, and finite). The essentially primal yet dyadic nature of its logical properties and its metalogical identity makes 2 a perfect primary expression and primal representative of abundant composite complexity. Thus, Ramanujan no doubt recognized and/or intuited superiority in its unique expression of numeric primality and its colossal abundance as

$$2n = 1/2\{N_{+\infty}\} \equiv n_{c \rightarrow \infty} \subseteq S_{N \rightarrow \{+\infty\}} \therefore \mathfrak{R}_\zeta(1/2) \blacksquare$$

Yet, technically, on its own, this section of proof and the facts (and explanations) might seem inadequate. However, if structural principles do not make **RH** true, there would be no way to

graph  $\mathfrak{R}_z(1/2)$  or easily map all  $\mathbf{N}$  and easily locate all  $n_P$  among the composites in  $\mathbf{S}_{\mathbf{N} \rightarrow \{+\infty\}}$  computationally (with senary semiotics and the numeric structural logic of  $n_C$  and  $n_{P \rightarrow \infty}$ ). Yet, that is proved with the map of  $n$  of  $\mathbf{N}$  (fig. 1, above), showing the relational potentials enabled by the intrinsic structural principles. That fact is also supported by Euler’s discovery that 2 is the result of subtracting the number of faces of any regular polygon from the number of its edges, thus

$$f_p + 2 = e_p$$

A better proof of the metalogical and logical structure of numbers, geometry, and maths seems impossible. That may not seem to prove metalogical and logical structural principles enabling the permanent reliability of  $\mathfrak{R}_z$  (at  $1/2$ ), but the Sierpinski and the Hausdorff “dimension” ( $D_H$ ) support the sufficiency of Euler’s proof. Thus, for Sierpinski’s curvy “gasket”<sup>[7]</sup>

$$D_H \equiv \log 4 / \log 2 = 2$$

That may seem too trivial to be relevant to solving **RH**. Yet, many formulas for generating very complex fractals are deceptively simple. For example, generating Sierpinski’s nested triangles and tetrahedrons both require that  $s = 1/2$  (the length of each side divided by 2).

If it were not for fractality (the subsidiary principle of structural logic) and computers, it could seem that has nothing to do with **RH**. It could also seem irrelevant that—like all equations involving fractions and ratios—Sierpinski’s curve equation is tripartite. It requires 2 terms (and values) in 1 ‘rational’ expression on 1 side of the equality, and only 1 term on the other. The significance and pervasively intrinsic potency of 2 and of 3 and, indirectly, also of  $6n$ , might seem nonexistent. Yet, for computational correction of deficiencies in technical representations of natural phenomena (etc.), the work by Lukasiewicz & Kleene<sup>[7]</sup> extended the potentials with senary logic (SLK). SLK confirms pervasive 2ness (duality) multiplied by 3ness (triality), revealing hexality as the primary bi-primal and tri-primal expression of dyadic logic amplified by triadic logic, also of the semi-primality that enables

Metatheorem H:  $6n \pm (n_P > 5) = (6n \pm 1) \subset \{\mathbf{S}_{\mathbf{N} \rightarrow \mathbf{N}_{+\infty}}\} \supset n_{P \rightarrow +\infty}$  ■

Translation: That metalogical metatheorem, re: the “twin prime theorem” (TPT), is verified by the results achieved with this metatheory of numeric structural logic and, graphically, by SLK. If that were not true, then Kleene’s stellar status as a great pioneer of computer science would be tarnished, at best.

That seems unlikely, and impossible. Now, mapping semiotic relations of the natural numbers with orthogonal, quadrinary graphs are useful because of principles—especially quadrinity, orthogonality, dimensionality, expressibility, projectability, visibility, necessity, and sufficiency. Necessity is essential because viewing graphic representations requires visibility.

Of course, understanding graphic semiotics also requires sufficient mentality and explainability. So, using senary logic to generate a spiraling hexal graph of the numbers (in base 6) makes the primals and primal couplets (AKA “twin primes”) much easier to see. That makes it easier to

understand the relationships of primals and nonprimals, like  $6n$ . It reveals the structural logic and relationship of primality with hexality, trinity, duality, and complexity (etc.).

Still, another visible example is the modified Ulam's Spiral with varying dot sizes. It shows the structural relationship of primals, semi-prime squares, and "prime rich" quadratic polynomials. It can and does that only because the metalogical principles of form, structure, and function put them only where they need to be in  $\{S_N \rightarrow N_{+\infty}\}$ . Thus, semiotically valid, structurally viable graphs and maps confirm the actuality and validity of the intrinsic logical and metalogical principles required for effective production and use of semiotic images (symbolic maps, etc.). That proves sufficiency of Riemann's use of the numeric, trigonometric, geometric, and semiotic logics and operations used to map the results of  $\mathfrak{R}_\zeta$  with  $s = 1/2$ . QED.

Also, it is no mystery that, in Ulam maps, we see patterns of highly complex structural logic expressed with quadrileneal morphology in 2D. So, images of complex number fields remind us of photomicrographs of atomic crystalline molecular structures with symmetries (cubic, tetral, hexal, etc.). Thus, it is no meaningless accident that the primal factors of quadratic polynomials closely align in a square graph based on 2D geometry.

That fact is as logical as using the word "squared" to label numbers multiplied by themselves ( $n$  to the power of 2), a dyadic operation and result. Using the term "power" shows that the early pioneers of maths realized the power (potential) and essence of intrinsic numeral logic. That was shown in the use of graphical geometric squares for proving the Right Angle Theorem; also in the graphs of the field of  $N$  (above, in fig. 1, a & b).

So, we can safely admit that the semiotic and mathematical possibility and effectiveness of graphing the whole field of  $N$  (or  $C_\infty$ ) and  $\mathfrak{R}_\zeta$  rely on the metalogic principles of structural logic enabling form, maths, geometry, topography, and semiotics. They reliably enable and rule graphic expression and the symbolic logic that enables and rules all operations, processes, functions, and results of  $\mathfrak{R}_\zeta$  and maths.

Thus, symbolically, the line of symmetry at  $1/2$  (in Riemann's most famous graph) expresses the intrinsic relationship of  $0$  and  $1$ , and of  $1$  and  $2$ , their primal potency and reciprocity (also shown by the relative identity of  $1/2$  and  $-2n$ ), but also its structural relationship with the other primal and nonprimal numbers in  $S_N \rightarrow +\infty$ . So, unless graphs of  $\mathfrak{R}_\zeta$  in  $C_\infty$  can change themselves for no reason (and start looking like results of principles of some other universe), then graphing  $\mathfrak{R}_\zeta$  with ( $s$ ) being  $1/2$  will always produce zeroes at the line of symmetry for the same reasons it has done so up to now.

Still, the critical question is why. The nature and potentials of nonprimal composites (and of  $\mathfrak{R}_\zeta$ ) make it possible, but again, we want to understand the reasons, the causes. The answer is clearly the enabling principles form, structure, functionality, and numeric logic.

So, again, why should any zeroes be on that line? Again, because the graph and numbers are symbolic. However, can somebody somehow disprove enabling structural relations expressed by graphing  $\mathfrak{R}_\zeta$  with ( $s$ ) =  $1/2$ ?

As proved here, with  $s = 1/2$ ,  $\mathfrak{R}_\zeta$  expresses **a)** the nature of primality and the primals, **b)** their relation to unity, duality, complexity and, hence, to multiplicity and simplicity of numeric identity, **c)** the logic ruling discreet and continuous phenomena, and **d)** the relationship of symbolic and actual realities.

Now, as show above, nothing in reality or maths can or will change the nature of the principles or relations involved. Also, the results of mapping  $\mathfrak{R}_\zeta(s)$  at  $1/2$  are computationally verified to ultra-colossal values of  $n$ . So, to disprove a proof of **RH** with structural principles of numeric logic and their enabling metalogical principles requires disproving the existence and functional effectiveness of principles in general. Obviously, if effective enabling principles did not exist then forms, structures, functions, symbols, maps, proof, and disproof would be impossible.

Unlike the artificial mysteries and mythic deficiencies of QM cosmology, there are no accidental anomalies in maths and arithmetic, nor in Riemannian geometry. So, it is no accident that **a)** the line of symmetry and the positions of the zeroes on it (with  $s = 1/2$ ) and **b)** that primals in their distribution throughout the nonprimals (in  $S_N \rightarrow +\infty$ ) are where they are. Also, primality is symbolically represented by **0** (zero) because it shows the absence of primality in the symbolic results. Put more simply, the zeroes on the purely symbolic line at  $1/2$  are gaps in the sequence of the values representing nonprimality.

So, zero is the perfect numeric symbol of absence and neutral primality, representing what the nonprimals in the series of  $C_n > 3$  in  $S_N \rightarrow +\infty$  are not (the positive primals  $n_P$ ). As proved above, in Quad. II ( $x-, y+$ ), the graph shows zeroes exactly where they should be, symbolizing logical symmetry of nonprimal numeric structure. Indeed, the negative zeroes reflect the absence of the positive numeric asymmetry on the at  $1/2$  in Quad. I ( $x+, y+$ ). Even the fact that when  $s = 1/2$ ,  $\mathfrak{R}_\zeta$  only puts zeroes (etc.) in Q.1 and Q.2 is relevant (expressing causal structural principles).

Obviously, for the **0s** of  $\mathfrak{R}_\zeta$  to be anywhere else, with any other distribution, they would have to be enabled and ruled by structural principles of some logic other than the logic of this universe (as it is). So, the orderly regularity of the zeroes shown at  $-2n$  in the graph, reflect the logical symmetries of the nonprimal numbers. So, we can agree that the structure of numbers is purely logical and metalogical.

Obviously, although 1 and 2 of  $1/2$  are neither identical, nor formally symmetrical reflections of each other, they express primal relativity and the complementarity of all dyadic structural relations. In other words, in  $1/2$  they express the structural and relational polarity and logical symmetry intrinsic to the potential and actuality of unity, including its inherent potential for implicate and explicate identity, multiplicity, duality, symmetry and asymmetry. Also, since  $\mathfrak{R}_\zeta$  only expresses its enabling principles, at  $s = 1/2$  it expresses the complementary duality of the primals  $p_n$  and composites  $n_C \geq 3$  (in  $S_N \rightarrow +\infty$ ).

Here is the core of the structural proof of **RH**: The zeroes on the line of symmetry can only progress on it and represent the positive side of the origin of  $Re+$  (**0,0**) at  $1/2$ , because it is the

positive reciprocal identity of  $-2$ . That clearly expresses and embodies deep structural integrity, relativity, and the reciprocity ruled by the principles enabling  $\mathfrak{R}_\zeta$  and numbers.

Also, the uniqueness of all primals is an expansion and reflective expression of the infinite primality, singularity, integrity, and the discreet identity of actual unity, and its primacy (the primary expression of primality). Hence, at  $1/2$ , the reciprocals and zeroes in Riemann's graph symbolize and express unity divided by complex exponential denominators and dyadic values. So, it is structurally logical that the zeroes are on the line of symmetry (at  $1/2$ ). Obviously, the enabling structural logic ruling  $\mathfrak{R}_\zeta$  makes **RH** true. QED.

## 2.5 Functional logic

“The art of doing mathematics consists in finding that special case which contains all the germs of generality.” – David Hilbert

Hilbert's opinion seems to reveal technical bias. If so, it blinded him (and others) to the whole of the linguistic, epistemic, axiological, and ontological dimensions of maths, metamaths, and **RH**. Maths is much more than a technical art. Yet, finding the best terms, definitions, and explanations is critically important. For example,

Metatheorem I:  $\exists \mathfrak{R}_\zeta :: \exists L_f :: \exists \{P_{ML}\} \supset \{\mathbf{POP}, \mathbf{NDR}\} :: \mathbf{RH} \equiv \mathbf{T} \blacksquare$

Translation: Riemann's zeta function & formula exist because functional logic exists. Therefore, its enabling metalogical principles exist. They are the superset of intrinsic principles that enable the principles of permanence and regularity and the natural distribution rule. They validate the existence, constancy, and functionality of the metalogical principles (of being). Therefore, Riemann's hypothesis is strictly equivalent to truth. QED.

Functionality is a principle of being's metalogical nature. As with form and structure, enabling metalogical principles make functionality and structure inseparable and interdependent. Thus, the existence and validity of the principles of regularity and permanence enable the **POP**, **NDR**, and **PRC** (the 'power law' of proportional relative change). The **PRC** is relevant because, like the **NDR**, though it does not prove **RH**, it proves the reality and constancy of nature's enabling principles. They also enable the proportionality and orderly regularity of the functionalities of  $\mathfrak{R}_\zeta$  and its results. So, the **PRC** is as directly integral to the functioning of  $\mathfrak{R}_\zeta$  as the **POP** (which enables and ensures its permanent reliability). Of course, they also make graphs of  $\mathfrak{R}_\zeta$  possible and reliably effective.

Likewise, the forms and structure enabling  $\mathfrak{R}_\zeta$  and the principles and rules of maths and graphs also determine and limit the possible functionality, and results. In fact, nothing else in the cosmos can enable and limit the functionality of  $\mathfrak{R}_\zeta$  and maths. So, although approximately 10 trillion zeroes on the line of symmetry cannot prove that they will always arrive there, the form, structure, functioning and operation of  $\mathfrak{R}_\zeta$  cannot put them anywhere else between **0** and **1**. In fact, the cause of even one of those symbolic zeroes being there (the enabling, governing principles and rules) is what puts all of them there, and always would, no matter how long the operation continued.

By 2018 it was obvious that the principles ensuring the reliability of both the gamma and von Mangoldt functions, among others, makes them complementary semi-analogs of  $\mathfrak{R}_\zeta$  that verify **RH**, indirectly. More importantly, they also confirm the existence, necessity, sufficiency, and reliability of the principles ruling all functions, operations, and semiotics. Understanding that enables understanding  $\mathfrak{R}_\zeta$  and **RH**, perfect proof and optimum explanation.

Now, remember that nobody could prove **RH** false, nor how or why  $\mathfrak{R}_\zeta$  could or would put a symbolic **0** anywhere but on the line of symmetry and at  $-2n$ . That can only be because others failed to see the true nature, deep meaning, and functionality of  $\mathfrak{R}_\zeta$  and the line of symmetry, (and what really makes it that). They also ignored the functional nontriviality of all 7 of the key terms (symbols) and the principles embodied and expressed by and as them.

Obviously, that was a result of not going back to the basics of the nature of numbers, maths, and geometry. For example, the relationship of geometry, numbers, principles, and explicate natural phenomena represented by the ratio labelled  $\Phi$  was crucially important to understanding  $\mathfrak{R}_\zeta$  and **RH**. The full significance of Phi lies much deeper than its relationship with the Fibonacci sequence and the Golden Spiral (etc.).

For example, the forms, structures, and relativity integral to  $\mathfrak{R}_\zeta$  and the [Farey Sequence<sup>\[?\]</sup>](#) enable their logical and semiotic functionalities. Naturally, nothingness is formless and nonexistent. So, nothing has no structure and no functionality. Yet, **0** (zero) exists, as a symbol, with a form and virtually limitless logical structural potentials. We can use **0** any way we like, but functionality depends on a thing's form and structural potentials. Nature's metalogical principles of being are what cause, enable, and sustain other things.

So, if we change a thing's form and structure, we also change its functional potentials. Likewise, if we change the form and structure of  $\mathfrak{R}_\zeta$  (or **RH**) that changes what it can do and what it means. That would change its identity and potential relationships. Then  $\mathfrak{R}_\zeta$  and **RH** would not be what they are. Obviously, if we do not change them, then their logical functionality remains, as determined by the intrinsic principles of form, structure, and maths.

Also, though analogs of **RH** do not prove it, they confirm the fact that the logic and metalogical principles enabling functional potentials, operations, and results are congruent (with reality) and reliable. Of course, many analogs of **RH** have been discovered, yet none have enabled proof. So, consider this meta-hypothesis:

IFF  $\mathfrak{R}_\zeta$  causes symbolic zeroes on the line of symmetry (in Q.1 of  $C_\infty$ ) and at every  $-2n$  (in Q.2), only when  $(s) = 1/2$  then, per the enabling principles,  $\mathfrak{R}_\zeta$  is effective and reliable. In that case, **RH** will never be effectively disproved.

Luckily, the principles, forms, structures, functionality, symmetries, and asymmetries enabling the relational potentials of **0** and **1**, and of  $1/2$  to both, are clearly visible in Farey's graphics. (see the Wikipedia article) They also demonstrate the reliable validity of the principle of permanence (**POP**). Among other realities (including identities, symbols, and constants), the **POP** sustains

the reliability of algebra and trigonometry. So, functional equations with ‘real’ numbers also work when using complex numbers. For example:

$$a^{s+t} - a^s a^t = 0 \text{ implies } x^{s+it} - x^s x^{it} = 0$$

In fact, the **POP** ensures the reliability of  $\mathfrak{R}_\zeta$  and proof. Regularity also enables and ensures permanence. So, the **POP** makes all valid operations and results in the complex plane always correct, permanently reliable. Look deeper and we see that the **POP** is reliably valid not because of axioms and technical proofs, but because the nature of form, structure, and functionalities enable its possibilities, potentials, and limits.

That ensures that using  $\zeta(s)$  can only cause zeroes (gaps) on the line of symmetry and at all  $-2n$  when  $\sigma$  (the real part of  $s$ ) is  $1/2$ . So, **RH** is true because the functionality of  $\mathfrak{R}_\zeta$  is caused and ruled by the root level metalogical principles of form, structure, and functionality.

That is also true because **RH** depends on the principles, forms, and functional properties of arithmetic, complex trigonometry, analytic Riemannian geometry, and upon the functionality of the integral operators, variables, numbers, symbols, and semiotic graphics. So, we can drop the confusing notion that primals  $> 3 \approx \infty$  and  $\mathfrak{R}_\zeta$  (and other functions ‘on’ complex numbers) have mysterious behaviors, as if they were mathematicians.

Mystery “behaviors” of mathematical functions are simply unexpected possibilities of the maths that were unknown or unrecognized and/or misunderstood, like “dark” energy/matter. Hence, using  $\mathfrak{R}_\zeta$  causes results we see because they are visible, semiotic, graphical results of mental operations of mathematicians. Seeing that helps prevent confusion, extra failures, and inferior proofs. It also lets us trust that changing the enabling, sustaining principles and functionalities of symmetry, relativity, and progressions is impossible. Therefore, symbolic zeroes (generated with  $\zeta(s)$  and  $\sigma = 1/2$ ) can only appear on the critical lines (at  $1/2$  and at  $-2n$ ) as their complexity progresses toward infinity.

Naturally, functionality, reciprocity, relativity, logical symmetry, and integrity are also enabled and sustained by the properties and potentials of causality and activity. So, no matter how far we extend the line of symmetry toward positive numeric infinity,  $\mathfrak{R}_\zeta$  will only keep doing what it does because intrinsic functional logic rules it, making **RH** true. Otherwise, the metalogical principles enabling reality, the **POP**, **NDR**, **PRC**, and  $\mathfrak{R}_\zeta$  would have to be dysfunctional. Yet, clearly, existence proves that is not so. QED.

## 2.6 Semiotic logic

“Mathematics is a game played according to...simple rules with meaningless marks on paper.” – Hilbert

Hilbert was wrong about that. If he was right, then his opinion on maths being a fine art was clearly wrong.

Doing maths at the level of a complex art is much more than a game or puzzle. If that were untrue, then **RH** may have been proved by Hilbert or Weyl, if not by Riemann. Figure 1 (a & b)

prove that maths is a very complex system of logical semiotics, a language, and a science that grows harder to master by the day. So, Weyl was clearly entitled to accuse Hilbert of playing games with his unfinished, ill-defined metamaths, meta-axioms, and notions.

Yet, we should not blame Hilbert for failing. Like Riemann's failure to prove **RH**, such failures prompted work that brought maths to its final, critical phase of development. So, we can now see the complexities as expressions of seemingly simple principles (of form, structure, etc.).

So, instead of seeing quadrant 2 (Q.2) of the complex plane ( $C_\infty$ ) and Riemann's zeroes there (at  $-2n$ ) as meaningless trivialities, this multi-level proof and definitive explanations were partly enabled by considering the significance of  $-2n$  and of the nonprimal numbers in general. Also, the symbols we use for doing maths have exact meanings we assign to them and maintain, in whatever system we use, which is critically relevant. That fact is far from trivial or meaningless. In fact, it confirms a core element of this proof: the psychosocially enforced linguistic causes of the many failed attempts to prove or disprove **RH**.

So, this subsection proves **RH** with the intrinsic principles of semiotics that enable  $\mathfrak{R}_\zeta$  and its results, the symbolic graph, its meaningful zeroes, and the proof, proving Hilbert wrong.

In the first place, despite the fairly simple rules of complex arithmetic, analyzing all the logical and metalogical elements of **RH**, Riemann's formula, and the graph (of  $\zeta(s)$  when  $\sigma = 1/2$ ) is clearly an unusually difficult task. In fact, as shown in the solution of the P/NP problem (and nearly 160 years of failures), **RH** is clearly an extremely hard **NP** complete problem. Also, neither Hilbert nor any other investigator before or since even tried to understand the principles that enabled the graph and its meanings. Therefore, they never mastered the art of providing the ideal proof with the best explanation. So, they failed to win the game and the prize.

Of course, that requires understanding the meanings of Riemann's graph. Now, that may seem odd. Thanks partly to Hilbert, graphs of pure maths can seem to mean nothing other than what a mathematician thinks about the numbers, points, and lines. Riemann's graph can be confusing also because it is said to be "analytic" in  $C_\infty$  while enabling meaningful analysis of nothing (or else of the points, lines, patterns, and symbols). However, seeing the symbols and patterns is not understanding their meanings, and what the whole map means.

Therefore, **RH** implies the answer to the essential question, "What does the graph mean?"

Not asking that question, prevented the answer necessary for a generally satisfactory solution. Now though, before presenting the logical evidence, consider the nature of the graph. Like all graphs, Riemann's amazing graph could exist because of numbers, maths, geometry, graphics, rules, ideas, and principles. So, we can analyze those logical elements of the graph to see if we can find a way that it (or  $\zeta(s)$  when  $\sigma = 1/2$ ) could cause an unexpected change of the nature of the integral process that generates those trillions of zeroes (on the line of symmetry).

Of course, we see above that nothing in the metalogical principles (of sets, form, structure, and functionality) can accidentally cause operational change of a valid functional operation. So, we



can see that if a mathematician or programmer uses Riemann’s formula and properly follows the rules (of the maths), they will never generate different results. Likewise, graphs do nothing but display visible results of operations and causal principles. So, we have no good reason not to trust  $\mathfrak{R}_z$  and the truth of **RH**. QED.

Yet, that begs another question, “So, are all the zeroes trivial, and the Clay prize and **RH** *much ado about nothing?*”

Of course, the correct answer is no. For example, in this case, **0** and **(0,0)** symbolize absence. The zeroes on the line at  $+1/2$  represent the absence of the orderly symmetries of the nonprimal whole numbers and their nonprimality. Thus, the pattern of zeroes on the line at  $1/2$  also approximates the distribution of primals in  $\{\mathbf{N}\}$ . The zeroes in Q.2 at  $-2n$  represent the absence of the nature of explicate primality and the relative randomness of the primals. They also verify the intrinsic metalogical reciprocity of  $1/2$  and  $-2$ , and the relationship of reciprocity to symmetry and asymmetry, and to unity, duality, and primality.

The semiotic principles of the graph of  $\mathfrak{R}_z$  at  $1/2$  also enable and confirm the meaning of **(0,0)** as a semiotic symbol of neutrality, the essential absence of positive and negative values central to the  $C_\infty$  (and the graphs of  $\mathfrak{R}_z$ ). The primal duality of  $1/2$ , and the symmetry and asymmetry of the values shown (on the line of symmetry) is also implied by **(0,0)** being between the opposite sides of the graphs and their  $x\pm$  and  $y\pm$  quadrants.

Also, 1, or whatever other semiotic unit is used to represent unity’s singularity, has exactly that meaning, and whatever other meaning we might give it. Thus, the meanings essential to  $\mathfrak{R}_z$  and **RH** are integral to and determined by the definitions and rules of maths and our conceptual, semiotic, and linguistic conventions. Also, if the semiotic elements of  $\mathfrak{R}_z$  and **RH** were simply meaningless trivialities, there would be no prize. Clearly, to think or say otherwise would be an outrageously illogical fallacy.

We cannot disprove that without making systems and thoughts impossibly meaningless. As we see visibly proven in the maps of  $\mathbf{N}$  (fig. 1, above), symbols of maths are intimately related to the principles, definitions, rules, forms, and systems that enable and sustain them. That metatheorem is supported by the **POP**, **NDR**, **PRC**, **CC**, the whole of this paper, and by the reality of the cosmos.

We also see semiotic logic and its enabling metalogical principles expressed in the relationship of numeric cardinality and ordinality. For example, they cause the values of the final digits  $\mathbf{d}_f$  at the ends of each  $n$  of each decan  $\mathbf{D}$  and magnitude  $\mathbf{M}$  in  $S_{N \rightarrow \infty}$ . So, the primitive natural numbers in the 1st  $\mathbf{D}_0$  of  $\mathbf{M}_0$  and in all other  $\mathbf{D}_n$  of  $\mathbf{M}_n$  (in  $S_{N \rightarrow \infty}$ ) end with a  $\mathbf{d}_f$  of 0 to 9.

That fact of numeric semiotics—and the fact that large primals  $n_p = 6n \pm 1$  and have only 3 patterns of  $\mathbf{d}_f$ —helps simplify their quick location with semiotic logic (& computation, as shown in proof of the **TPC**, in subsection 2.8). We also see that every 1st number of the 1st  $\mathbf{D}$  of each  $\mathbf{M}$  must be preceded by a multiple of both 9 and 11, with [final digit]  $\mathbf{d}_f$  9 ( $3^2$ ). Naturally, 11 and all

other 2<sup>nd</sup> numbers of  $\mathbf{D}_n$  of  $\mathbf{M}_n$  can only be reduced to the 2<sup>nd</sup> primally primitive value, 2 (by summing their digits to a resulting primitive  $n$ ).

If it not for Collatz, Newcomb & Benford (and the **NDR** and **PRC**), all that might seem trivially coincidental or causelessly accidental. Yet, recall that the **NDR** and **PRC** prove nature's love of order. So, metalogical regularity enables the regular distributions of natural phenomena, including the distribution of  $n_p$  in  $\mathbf{S}_{N \rightarrow \infty}$ . That is not a mistake, the visible positions of the primals is caused by the regular logical orders of preceding nonprimals.

Those truths confirm proof that intrinsic principles enable and sustain the semiotic potentials, complexities, and relations of all numbers, arithmetic progressions, and graphs (of  $\mathbf{N}$  and  $\mathfrak{R}_\zeta$ ). In other words, the morphological principle of ordinality enables the semiotics enabling graphs of  $\mathfrak{R}_\zeta$  and  $\mathbf{N}$ . Cardinality enables the value of each  $n$  of  $\mathbf{N}$ , because the **POP** sustains the durable interdependence of cardinality and ordinality. Otherwise, the **CC** would be untrue, and neither semiotics nor trigonometry could exist. Then neither  $\mathfrak{R}_\zeta$  or **RH** could exist.

Logically and metalogically, semiotics and the functional operations of maths and geometry are interdependent. Therefore, proving **RH** required validating the semiotic principles enabling use of  $\mathfrak{R}_\zeta$  and its results. It also called for remedial consideration of the linguistic deficiencies that prevented earlier understanding and comprehensive proof.

Of course,  $10^{12} + n$  zeroes made it seem wise to find out why **RH** is true. It was also motivated by the odd fact that, since Gödel, no famous mathematician (not even John Forbes Nash) could find what it takes to explain either why **RH** is true, or why not. It seems most likely that they were also unable to explain their inability, or to find even a hint of a clue to resolving their dilemmas.

Nor did they offer any really good reason why the zeroes on the negative half of Riemann's graph should be considered trivial, or why the others should seem nontrivial. We can now see that issue as a matter of highly dubious opinion. More importantly, why should any logician or mathematician ever think that any result of a mechanical function is more mysterious than any other, or any less important to understanding it and its nature?

In fact, we can now see that the nature and all the forms, structure, functionality, semiotics and rules enabling  $\mathfrak{R}_\zeta$  determine the only possible results of its use. Yet, without a well-developed ontology of maths and metamaths, a truly viable metatheory of the essence and nature of  $\mathfrak{R}_\zeta$  would be missing. It would then seem as mysterious as ever.

Again, what really caused absence of a metatheoretical ontology of maths, logic, and semiotics? Derbyshire<sup>[9]</sup> thought that one of the historic causes of the problem encountered with **RH** is that early maths was mainly used for counting and measuring. He was right. Confusion then grew and spread, somewhat like the Ptolemaic cosmology of the old Roman Catholic Empire.

Then, as time went by, methods for measuring became increasingly more sophisticated than mere counting. Even colossal numbers of discrete objects or groups may be counted with the

same basic methods that worked thousands of years ago, particularly in India. So, eventually, the culture of mathematicians came to be dominated by people who were more interested in the more interesting and rewarding uses of maths than in its essence, its nature, the principles. The problems mounted, compounding, leading to subliminal biases, for example, against composite numbers, multiples, especially the dyadic multiples (of 2). That made it almost impossible to see the orderly composite forest for the trees (the “primes”).

Derbyshire also noticed that the semiotics and semantics of discrete and continuous maths kept diverging. Yet, from time to time, they also partially converged, intertwined and over-lapped. That often occurred as predictive statistical work progressed, especially in the physical sciences and technology. Confusion was bound to increase and spread, in both physics and maths, skewing the paradigm. It became virtually impossible to see that **RH** could not be proven or disproven only by investigating the technical application of  $\mathfrak{R}_\zeta$  and related functions.

The answer to Riemann’s question did not require exhaustive investigation of applications and functional analogs. That is what derailed and delayed a comprehensive answer. The important question and answer relate to the nature and meanings of the graph, the numbers, the logic, and metalogical principles enabling and sustaining them.

For example, integrity, the structural principle, supports the principles, properties, functions, and potentials of the semiotics enabling additive progression, and its relation to multiplicative expansion. Accepting all that may seem like an act of blind faith, but the principles of nature, semiotics, maths, and the vast quantity of verified evidence is not merely circumstantial. The graph of  $\mathfrak{R}_\zeta$  verifies that by showing us trillions of zeroes only at  $-2n$  and  $1/2$ , nowhere else.

Naturally, ignoring the **POP** made definitive proof impossible. That proves the negative power of language and degraded semantics, the power to obscure and confuse, for millennia. However useful, however close to perfect, statistical approximations are neither exact nor discrete. Probabalistic approximation of hyper-colossal sequences of ultra-colossal composites far out in  $S_{N \rightarrow \infty}$  do not show us where the next primal gap ( $n_p$ ) will be. Nor does it help us understand the nature of Riemann’s question or the graphic results of  $\mathfrak{R}_\zeta$  (with  $s = 1/2$ ).

Apparently, not seeing Riemann’s semiotic forest because of more “interesting” trees became a self-perpetuating habit reinforced by confusing vocabularies, jargon, dogmas, misconceptions, personal difficulties, and preferences (then more divisive specialization). Regardless, the nature and reliability of graphs, semiotic operations, logical and metalogical principles enabling the  $C_\infty$  and  $\mathfrak{R}_\zeta$  are reliably constant; and **RH** is clearly true. QED.

## 2.7 Primal logic

“Mathematical science is in my opinion an indivisible whole, an organism whose vitality is conditioned upon the connection of its parts.” – David Hilbert

Thinking that maths is a science and an art makes sense. Thinking it could also be like an animal or a plant, or a game—played by “simple rules with meaningless symbols”—is nonsensical. As

shown above, maths is a language that enables logical semiosis and operations for the sake of better understanding of reality, being and its nature.

Could being, nature, maths or metamaths exist and function without primality, the metalogical principle, and its elemental expressions and effects? The maps shown in Fig. 1 prove the truth. Numeric logic and the principles of primality, integrity, and permanence ensure the constancy of the identity and properties of unity, of the numbers 1, 1/2, and of all other identities, and all other principles. For example, the identity and numeric symmetry and asymmetry of halfness (in the ratio we label 1/2), reflects the primal relativity of unity and duality, but also the dyadic relationships intrinsic to each sum and iteration of  $\mathfrak{R}_z$  and its infinite series at  $-2n$  and 1/2.

That metatheorem verifies the significance of the infinite series—in Q.1 and Q.2—in Riemann’s graph of  $\mathfrak{R}_z$  (where  $s = 1/2$ ). Doubting the integrity and constancy of the principles that enable and sustain the functionality and results of  $\mathfrak{R}_z$  requires doubting the nature of logic and reality, an example of foolishness. As shown here, we can trust that **RH** is true because of the reality and reliability of primal principles, properties, and the potentials of

- Geometry, maths, numbers, and series
- Arithmetic, complex maths, and numerical progression
- Calculus, algebras, sets, functions, and operations
- Nature, form, structure, functionality, and semiotics
- Being and its generative principles

Clearly, all possible phenomena are what they are because nature’s original logic makes them so, either constantly and durably or transiently, impermanently. As proved above, integrity, regularity, immutability, and reliability are principles that enable and sustain the permanent nonphysical constancy of the logical and metalogical principles of being and maths (etc.). Otherwise, there would be no constancy of maths and no reason for theorems and proofs.

At the least, **RH** is true because the functionality of  $\mathfrak{R}_z$  and additive progression are results of the nature, form, structure, functional, and semiotic principles that enable and sustain them. Otherwise, they would be other than what they are, some other way. Yet, the reliability of the maths persists

We cannot over-emphasize the importance of the super-abundant evidence provided via the **NDR** (and the Newcomb-Benford curve), the **PRC** (the ‘power law’ of proportionally relative change), the Collatz cascade process (**CCP**) and its reverse (**RCC**), the **POP**, and the necessity, sufficiency, and explainability of primal integrity and identity. However, also recall that ratios express relationships. So, mapping  $\mathfrak{R}_z$  (with  $s = 1/2$ ) displays the relationships of primality, relativity, duality, symmetry, and asymmetries (etc.) inherent in numeric logic. The logic and rules of the maths and of the semiotic graphical system enable and ensure valid results.

Thus, the symbolic relationship of 1/2 to the zeroes on the virtual line of symmetry—evenly dividing “the critical strip” between 0 and 1—displays the original relationship of universal

unity, duality, and virtual nothingness. Hence, it also reflects and graphically maps the primal division of unity, enabled by multiplicity (the principle) and the dyadic function of addition.

As already proven (see fig. 1, above), the distribution (and ordinal locations) of primals in the progression of  $S_{N \rightarrow \infty}$  express their nonrandom relativity to the nonprimals that precede them. The numeric logic of  $(n + 1) \rightarrow \infty$  and addition ensure the properties, locations, and numeric symmetries of the nonprimal even and odd numbers. That enables the locations of primals larger than 5 between them (at  $6n \pm 1$ ). The sequences of digits in ultra-large primal numbers (and their reciprocals) are also enabled and determined by the principles of numeric logic and primal metalogical principles enabling it.

Likewise, the nature of numeric logic making the location of the line of symmetry at 1/2 (in Riemann's graph) expresses the relationship of **0** and the primary positive number, 1, and the primary even number, 2. Together, they represent and demonstrate primality and the primal relativity of unity, duality, integrity, and complexity. That also relates to the virtual primality in all subsequent identities, values, quantities, numbers, ratios, and subsidiary relations. Thus, nondual relativity, integrity, symmetry, and asymmetry also express the primal metalogical principles enabling and sustaining reality, processes, events, and operations.

Now, recall that complementary relativity (of asymmetry and symmetry, etc.) exists because the nature of primal principles makes them equally relative identities. Yet, all are virtually absolute. So, relativity enables the reciprocity of their primal forms and structural qualities. That enables the equally viable functional potentials of primal principles. Thus, the subsidiary principles of maths and semiotics that enable the functionalities of  $\mathfrak{R}_z$  and the graphs are sustained by the primal metalogical principles sustaining nature, its reality. Hopefully, this proof of **RH** and this preliminary completion of the foundation of maths will clear the air and the way forward. The content included in the next subsection provides more support with unconditional proofs of other formerly unsolved problems.

## 2.8 Related proofs

“How thoroughly it is ingrained in mathematical science that every real advance goes hand in hand with the invention of sharper tools and simpler methods which, at the same time, assist in understanding earlier theories and in casting aside *some* more complicated developments.” – David Hilbert

He was clearly right again. The results of this work provide abundant, absolute proof of the truths and potentials Hilbert considered important. Yet, the value and importance of many other indispensable necessities now seem to be generally unknown or unrecognizable and, in some circles, unacceptable.

So, some may doubt or object to the ontological necessity of being (and its nature and sufficiency) as the enabling, sustaining origin of the primal principles enabling the reality of science, maths, and metamaths (also their intrinsic value and importance). It may be possible to eliminate such doubts and objections with unconditional proofs of other major problems that demonstrate the metalogical nature of numbers and maths that enable the truth of **RH**. Hence, also verifying the new theory and metatheory supporting proofs of **RH**.

For example, some truly brilliant mathematicians thought that if Goldbach's conjecture (GC)—about a potential possibility of creating any even number by summing just 2 primal numbers—is true, then RH could be proved true. Yet, despite thinking GC somehow relevant to RH, they failed to prove and explain why and how. Some vaguely intuited deep structural relations of maths and/or numbers. However, it seems that no other mathematician even tried to discover the principles that enable the qualities, properties, and potentials of numbers that enable their functional and relational possibilities (for use with any kind of maths). As shown above, that long failure was caused and maintained by the deficiency of unfinished metamaths.

As proved above, that caused the many other deficiencies of maths and the famous failures of so many great mathematicians. Fortunately, as proven below, eliminating deficient metamaths enabled understanding that enabled more realistic, holistic number theory. That enabled proof that GC being true confirms the truth of RH, and why. Of course, as mentioned above, the same is true of Collatz's conjecture (CC), the "Twin Primes" conjecture (TPC), and related problems (unsolved because of deficient number theory, etc.).

Still, as also mentioned above, proofs involving new concepts and metatheory require recognizability (and thinkability) as much as provability and reality. That seems especially relevant now, while the upgrades of metamaths, set theory, proof theory, and number theory (etc.) are not yet accepted by all mathematicians and teachers of maths.

So, this set of proofs begins with a proof of the [Quine-Putnam Indispensability Thesis](#) (QPIT)<sup>[2]</sup> and the related arguments for and against it. They can enable insights that permit explanations and corrections of a) its associated assumptions, b) the claims, and c) some deficiencies of proof theory. Thus, it can enable better recognizability and easier understanding of the proofs of the more difficult problems, below.

That is so partly because analysis of the problems, deficiencies, notions, and claims in the QPIT revealed 4 essential yet ignored or generally under-valued elements of proof and proof theory: a) recognizability, b) explainability, c) falsifiability, and d) disputability. Of course, they are not the only important principles of proof theory. Yet, without giving them due respect and praxis, disputability and falsifiability seem relatively unimportant or even trivial (in considerations or arguments, re: validity/reality and/or falsity). That problem often relates to a tendency to accept wild hypotheses and theorems having little or no explainability (and deficient reality).

For example, re: the QPIT—in unresolved arguments over the indispensability of maths (and definitions of finitism, realism, idealism, neo-platonism, naturalism, and holism)—finding no clear, easy way to settle the disputes seems to prevent satisfactory proof and better metatheory.

However, that dilemma only exists because of illogically erroneous assumptions, notions, and definitions. Consider the notion of conservativity, then indispensability. First, Hilbert saw that the principle of conservativity as most necessary to the viability of his program. Yet, he failed to see (or care) that not fully defining his 'finitistic' system's terms and axioms made effective functionality and ideal explainability impossible. So, conservativity is much less important than definability and explainability. Clearly, provability is essential, but it may be prevented by a lack of recognizability.

For example, non-holonomic paradigms of science and society grow ever more obsolete and absurd because they limit thinkability that limits or prevents the recognizability (and/or acceptability) of realities. Therefore, lack of sufficient definability and explainability proves that the conservativity and/or reality of a theoretical system (and/or a proof) is deficient, impossible, or nonexistent. So, any proof or system that lacks definitive explanation fails to exhibit sufficient necessity for durable indispensability.

Now, if we accept realistic definitions of maths and science, that should settle the disputes over the QPIT (etc.). However, if that is untrue, then the QPIT is unprovable, making the associated problems unresolvable. That is clearly because proving the QPIT depends on the definitions of the terms: mathematics, science, indispensability, and proof.

Without optimal definitions of key terms, a system or theory lacks optimal provability and explainability. So, deficient definition prevents optimum understandability, and any attempted resolution remains unsatisfactory and disputable or impossible. That is so because the purpose of theory and proof is satisfactory certainty or, at the least, better understanding.

Thus, claims and arguments for or against the QPIT relying on poorly defined terms, theorems, or paradigms are all logical fallacies, insufficiencies. That makes them dispensable. So, consider the elements of the following proof.

First, the QPIT claims that maths is indispensable to science; and, because our best science is trustworthy, we can and should believe that all provable theorems of maths are equally valid and trustworthy. So, the QPIT says that proves it true.

However, the problem is not just a matter mathematical logic. The problem's root issues are also ontological, axiological, and linguistic. So, since it is commonly assumed that science is more ontologically grounded in verifiable facts and self-evident universal phenomena (than maths), we can start with science.

Clearly, if science is study and praxis performed for the sake of knowledge and understanding, and they are of value (for the sake of optimal quality of life); and—if that supports optimum quality of thought, communication, conduct, and results—then we can say that science is truly beneficial and trustworthy. In turn, we can then say that good science includes all valid or usefully viable theorems and axioms (fostering and supporting the logical and ethical integrity of science and scientists). We could also agree that—without fulfilling its necessary and sufficient purposes—deficient theorems and ineffective practitioners of scientific disciplines are neither beneficial nor reliably trustworthy.

However, we should also recall that no theory or theorem is eternally beyond improvement and/or replacement. That is central to the importance of disputability, falsifiability, and proof. We should also remember the distinction between pure science and applied science. Applied science can be performed for commercial or egoic purposes, regardless of unethical or generally harmful results. That complicates the definition of “science” (and the QPIT problem).

Also, with the exception of holonomic metatheorems of viable metatheory, great theory can be logically self-consistent, yet not completely logical or logically complete. That was proven by **GIT** (Godel's incompleteness theorem). So, the arguments of illogical theorists who fail to trust valid theorems and/or reject 'hard' evidence (proving the QPIT) disqualify themselves.

So, if we define maths as a language—a logical system that enables praxis, and/or describing, defining, studying, discovering, and understanding realities, processes, and phenomena—then maths is also a science. Clearly, maths can be and is an effective language for fulfilling its basic purpose, including the study and praxis of pure maths and its metatheory. Hence, it can be necessary and sufficient for the most effective communication of various facts of science.

Yet, as both Riemann and Hilbert knew, using cryptic semiotic symbology, terms, expressions, equations, and formulas of maths to “do it” is an option, not an absolute necessity.

Riemann openly stated that he preferred communicating his ideas and discoveries with words (of his “native” German language). Riemann's “ideas” and works were mathematical. So, that affirms that defining maths as a language is valid, enabling elimination of doubts and disputes (about its indispensability). It also enables proofs that eliminate objections and disputes based on the false opinion that maths is only the use of abstract symbols to perform calculations and communicate or publish the results.

Sadly, deficient metamaths and modern maths curricula caused and maintain that defective opinion. However, we can use the science of philology as a test-case (re: the QPIT). Philology requires studies of language, culture, and history. Of course, maths may be part of a culture and its linguistic paradigm, but not necessarily required to do research and theory of philology.

The best example, from Riemann via Hilbert, is maths itself. For example, instead of using many complicated mathematical operations and exotic symbology, Riemann preferred explaining “the ideas” required for a theorem or proof with words. Clearly, that may sometimes seem more difficult. Yet, any principles, phenomena, or processes we understand well enough can be proven and explained without using abstract symbols (numbers) and formulas of maths. So, the philology of any culture supporting maths can effectively describe and explain the nature and history of its language without using mathematical methods. That seems to falsify the QPIT. However, the fact that maths enables both practical work and intellectually exotic results, does not make it less reliable than any other languages used by scientists. Thus, doubts and disputes about the QPIT not based on all the realities of maths are either based on specious reasoning (only seeming plausible) or upon illogical premises based on misunderstanding. In other words, depending on ideas about languages, science, and maths, the QPIT may be considered either true or false.

Still, a perfect, unconditional proof of the QPIT can eliminate disputability and enable optimum explanation. That requires comprehensive analysis of the intrinsic logic, metalogical principles, and the facts and truths involved. We can then analyze the definitions and claims given above (of science, maths, etc.), and accomplish an example of holonomic proof theory. It can also



enable unification of metamathematical, sociological, ontological and axiological realism, idealism, naturalism, and holism (if not finitism and neo-platonism). For example,

Starting with “science” as definition 1 ( $D_1$ ), and “maths” as definition 2 ( $D_2$ ), we can define the metalogical ontology of a new thesis, QPIT<sub>B</sub> ( $D_3$ ), for a perfect proof of its absolute truth. Now, we can let  $D_3$ ,  $D_2$ , and  $D_1$  be logical theses ( $T_L$ ), composed of intrinsic theorems ( $T_i$ ), composed of valid axioms ( $A_V$ ). Those must be based upon and express only factual truths and/or logical actualities ( $A_L$ ). They can only embody or express enabling ensembles of natural metalogical principles ( $P_{ML}$ ). So,  $D_3$ ,  $D_2$ ,  $D_1$ , and all  $T_L$  and  $A_L$  are factual actualities of universal reality ( $U_R$ ). Now, with sentential logic and set theoretic semiotics, we see that  $D_1$  implies  $D_2$ ; and also that

$$\because U_R \supset P_{ML} \wedge \{P_{ML}\} \supset A_L \supset A_V \subset T_i \subset T_L \therefore D_3 \ni D_2 \ni D_1 \wedge D_1 \supset T_L \text{ and } \therefore$$

Metatheorem J:  $D_3 \equiv T_L \therefore D_3 \subset U_R \wedge D_3 = T \blacksquare$

Translation: Because of the nature and actuality of universal reality, it enables and sustains all its intrinsic metalogical principles (of being). So, they enable ensembles (subsets) of the superset of metalogical principles. It enables the logical elements of actualities enabling (truly logical and viable) subsets of axioms that the subsets of intrinsic theorems of viable theories. Therefore, since the new definition of the QPIT contains the valid definition of maths, and science contains the reality of maths, the knowledge of science is a superset of all logical theories. And, therefore (by definition),  $D_3$  (QPIT<sub>B</sub>) is strictly equivalent to  $T_L$  (vially valid theory). Therefore, QPIT<sub>B</sub> is a subset of universal reality, making it (QPIT<sub>B</sub>) true. QED.

So, naturally, the **POP**, **NDR**, **PRC**, and proof of **RH** provide verification of metatheoretic proof of the metalogical principles enabling QPIT<sub>B</sub> and the set-theoretic logic of the proof (and maths, etc.). Still, we can do a more detailed analysis of the claims, words, sentences, meanings, elements, and principles enabling the logic of QPIT<sub>B</sub> and the following proofs.

For example, this set of proofs confirms the ontological reality of being and its triadic, tripartite, trimodal, and triphasic modes. That claim relates to the infinite, very subtle, purely virtual, and mental forms of phenomena. It also refers to finite, transfinite, subtle, quasi-virtual or infinite psychophysical expressions of natural potentials. So, we see finite (gross or overt) physical embodiment and/or expression of something (a graphic or sculptural form). We can also perceive more subtle, transfinite phenomena (sound, music, etc.), and the infinite, purely virtual phenomena (principles, illusions, etc.) that enable being and its nature. Therefore, we can consider and understand the logical and metalogical elements of maths, science, and reality.

So, now, though universal being may seem the most fundamental actuality to prove, we first need relevant definitions of actuality and reality. However, recall that they are not identical, in principle. Still, they are functionally interdependent. In fact, their very subtlest form of existence and infinity exists only at the level of principle and virtual information. Yet, to prove that, we must accept the actuality and realities of our own expression of mentality, which we can prove. To do that we need to accept the actuality, reality, validity, reliability, and possibilities of perception, conception, knowledge, physicality, and stupidity. Accepting the principle stupidity is essential for avoiding endless wild goose chases.

Still, each of the preceding metatheorems could be disproved by just one counter-example. Of course, any such counter-example would disprove existence, knowledge, communication, and maths. So, we can trust  $QPIT_B$  and its prime premise, that  $D_1$  implies  $D_2$ .

■

So, solutions of **GC**, **CC**, the **TPC** and **P/NP** problems enable seeing that just **GC** and the **P/NP** problem are nontrivial examples of meta-truth. Consider this example:

NP-A: With a great algorithm and good software, very rapid authentication, and verification of hyper-compression and the correct encoding & decoding of ultra-large datafiles, encoded with uncrackable encryption (such as OTP code) are easy, computationally economical processes. However, hacking a truly ultra-secure document (or system) is an ultra-difficult NP-complete problem.

Why is that so? According to Bruce Schneier (and other cryptographers), one-time pad (OTP) encryption code is truly uncrackable without the key. So, a huge video file or document encoded with OTP or functionally equivalent encryption is uncrackable. Yet, with the key and good software, verifying proper encoding and decoding is easy, fast, and economical.

Therefore, despite the logically simple, fast use of a well-designed OTP system, without knowing the key or how to find it, attempted cracking is useless — or is it?

Is it possible to crack an OTP code file quickly, with an ultra-fast super-computer of the future, with super-AI (optimal 'machine intelligence')? If the answer is yes, then the hardest NP-complete problem would be easily computable, solvable or decidable. Yet, an automated, spoof-proof, deeply secured AI system with integral (uncrackable) encryption might use:

- ✓ dynamically evolutionary, extensible key generation methods
- ✓ complex multi-biometric & logical authentication protocols
- ✓ stealthy defensive counter-measure protocols
- ✓ adaptive self-optimization and
- ✓ program & data code secured with OTP-equivalent encryption

Such a system might be unable to decode or crack and hack a user's secured program code, data, messages, and online interactions. Such a system would be truly unhackable and uncrackable. So, example NP-A remains **NP**, not **P**, not computably solvable in a reasonably short time. Now, remember that the OTP subsystem is secured with self-optimizing AI-logic (without a secret backdoor or admin over-ride). Also, the key could then be one of an infinite number of code strings, of any length. If the system is a globally networked hyper-computer, theoretically, the length of an evolving OTP master key could be astronomical (overwhelmingly large). So, NP-A proves that **NP**  $\neq$  **P**. QED.

Consider another disproof, using a possible communication code for robotic spacecraft and base-stations (and HQ centers):

NP-B: Imagine humanoids with truly superior intelligence, with ultra-efficient AI-enhanced logic infrastructure, hardware, software, data compression, and ultra-secure code. They want that for optimal quality assurance and safety. Also, uncompressed messages take too long,

requiring too much energy, bandwidth, lots of extra error-detection/correction code, and too much processing (to ensure message integrity over ultra-long distances, with many kinds of interference along the way). If such advanced people also wanted to keep their presence unknown, for better or worse, they would also use something like OTP encryption to make message code look like truly random, high-frequency stellar noise.

So, such highly optimized messages would not only be uncrackable, they would be unrecognizable as communication code, thus undetectable by us. Additionally, without a Rosetta Stone, even if it was somehow possible to crack uncrackable code, their alien language and highly superior logic would be unintelligible to inferior beings (us). That makes this an example of a double hard NP problem. So, NP-B proves that  $\mathbf{NP} \neq \mathbf{P}$ . QED.

However, despite ever-better super-computing AI systems, the most compelling disproof is the long failure to resolve either the crisis in metamaths or **RH**, the **TPC**, and **P/NP** problems. Those are all clearly excellent examples of hard NP-complete problems.

The failure to finish defining and developing metamaths with supercomputing AI-enhanced systems is another concrete disproof. The possibility that no attempts were made to use AI-enhanced supercomputing systems to solve the Millennial Challenge problems (not even for \$1 million each) would be another disproof (due to deficient recognizability, unthinkability, etc.). If that is not so, maybe the failures were just too embarrassing to report.

Yet, with adequate understanding of the enabling metalogical principles (of metamaths, etc.), an AI-system might be designed and programmed to do what this author accomplished. Still, in the possibly infinite lifetime of the universe, ultra-hard NP complete problems like NP-A and NP-B will remain unsolvable as P problems. So, **P/NP** is resolved.  $\mathbf{NP} \neq \mathbf{P}$ . QED.

■

Coincidentally, that means that the SETI project was probably useless or worse. They may as well have looked for superior terrestrial intelligence.

So, before moving on to proofs of **CC**, **GC**, and the **TPC**, consider how **RH** and  $\mathfrak{R}_z$  could relate to the **P/NP** problem and proof (and vice versa). First, resolving questions of computability and decidability depends on having a valid paradigm of mathematical logic and adequate semiotics. The nature of the problem posed by **RH** was caused by the inadequate philosophy of science and incomplete metamaths. That delayed development of appropriate semiotics and semantics. Thus, without viable language, ontology, phenomenology, metatheory, and semiotics—for recognizing and communicating the required metalogical concepts—realizing the nature of **RH** and the **P/NP** problem was impossible.

Now, on to **CC** and Collatz's "hailstone" cascade process (**CCP**). Some mathematicians still doubt that its arithmetic can always reduce any number  $n$  (no matter how large) to a final result of 1. Now, so far, serious investigators know that the reverse Collatz process (**RCP**), starting with 1, then back to an original  $n$ , always works. However, in maths, reversibility always has and still does prove the reliability of a process.

Yet, some modern experts disagree. They doubt that the original **CCP** (cascading forward & down) is fully reliable, denying that **RCC** confirms absolute proof of **CC**. Why they suffer doubt and denial is another example of the linguistic deficiency problem and, of course, of the lack of adequate metamaths metatheory. So, previous investigators were unable to understand why the **CCP** and **RCC** work and what enables reversibility of any mathematical process.

Therefore, the doubters were unable to see what they missed. They failed to see that **CC** applies only to the original technical and logical issues (and the requirements of proof) relevant to using whole numbers (including negative whole numbers). Hence, they think that the **CCP** should be able to work in any exotic realms of numbers and maths. Yet, the **CC** has nothing to do with principles, rules, and potentials enabling other kinds of numbers and maths beyond the limits of **N** and simple arithmetic.

More importantly, the doubters also fail to see the full importance of **CC**, the **CCP**, and **RCP** to the theorems and metatheory of numbers, proof, logic, maths, and metamaths. So, naturally, they fail to consider the necessity of viable metamaths for solving inherently metalogical problems.

The effectiveness of the **RCP**—and reversibility in general—are valid confirmations of the reliability of the operations, processes, and results of maths. Obviously, the **RCC** proves and verifies that reversibility is an essential principle of proof theory, at least for verifying the reliability of operational and procedural functionalities of maths. enabling and governing principles of logic and metalogic are real, necessary, and sufficient. The **RCC** also proves and verifies that metalogical principles of numeric logic, form, structure, functionality, and relativity enable the properties and functional potentials of numbers and arithmetical operations.

Those truths are verified by the fact that the functionality of numbers and maths are not man-made inventions. Their nature and potentials are enabled by the nature of being, its metalogical principles. So, we can invent mathematical theorems, functions, formulas, and procedures; and we can discover and verify their potentials, yet nature makes it all possible. It also enables our ability to discover and understand the metalogical principles of nature that enable subsidiary logic, numbers, and maths (etc.). For example,

Metatheorem K:  $\exists \{ \mathbf{CCP} \rightarrow 1 \wedge \mathbf{RCP} \leftarrow 1 \} \wedge \{ \mathbf{N} \} \therefore \exists P_{ML} \subset \{ P_{ML} \} \supset L_f \wedge \{ \mathbf{N} \} \therefore \mathbf{CC} \equiv 1 = \mathbf{T} \blacksquare$

Translation: We can see all examples of the **CCP** and **RCP** as a functional set and all possible expressions of numeric logic as a functionally logical set. They exist because their ensembles of enabling metalogical principles exist as subsets of all natural metalogical principles of being; and they are a super-set enabling the principles of functional logic and all possible expressions of numeric logic. Therefore, Collatz's conjecture is strictly equivalent to and congruent with the primal unity and identity of 1, equaling truth. QED.

That self-validating meta-proof of **CC** was technically well-proven by others.<sup>[2]</sup> Yet, we can prove **GC** and the **TPC** with metatheorems that enabled the proofs of **CC** and **RH**. For, clearly, this proof of **CC** verifies the logical and metalogical principles that enable and determine all the properties and potentials of numbers and maths. Obviously, it also shows how and why prior

approaches either failed or produced inferior results. However, the other proofs support the validity and superior explanatory power of these results.

Still, it may seem naive to claim the best unconditional proof of **GC** for all  $2n > 4 = p_1 + p_2$  (i.e.,  $2n \in S_{N_e \rightarrow \infty} \supset 2n = p + q$ ) while, at the same time, trying to reinstate 1 as the primal **P** (or Prime prime). Yet, despite that, this proof will not rely on the use of 1 (for easier provability).

However, to understand proof of **GC** (and **RH**) while sustaining logical integrity, we must keep in mind that comprehensive proof of **CC** confirms the realities and relativities of numbers and the potentials enabled by numeric logic and intrinsic metalogical principles. Also, the serial progression of consecutive natural numbers  $S_{N \rightarrow \infty}$  is infinitely extendable by the simplest of all mathematical operations, addition of 1 to each prior sum, starting with either 1 or 0. So,  $S_{N_e \rightarrow \infty}$  can be extended by both addition and multiplication. The value of those seemingly trivial truths can be seen in figure 1, above, and proved by using both operations concurrently (to locate the primals of **N**). Naturally, that is possible only IFF the enabling **a**) numeric and semiotic logic, **b**) appropriate metalogical strategy, and **c**) an integrative algorithm are used with AI-enhanced heuristics.

Now, remember, as the quantity of whole nonprimal numbers in  $S_{N \rightarrow \infty}$  increases, their size, composition, numeric complexity, and factorability also increase, proportionally. Thus, the probability of composing any ultra-large hyper-composite of  $2n$  with just 2 primals increases with size and intrinsic complexity. As shown above, those facts are enabled by the power law (of proportional relative change, **PRC**), the principles of relativity, reciprocity, proportionality, symmetry, and regularity (among others) enabling the properties and potentials of numbers and numeric logic.

So, the increasing quantity, size, intrinsic complexity, and factorability of ever larger composites is proportionally reflected by the decreasing quantity of primal numbers. Yet, probability does not equal reality. Also, checking all possible hyper-colossal  $2n$  is impossible. So, creating each  $2n > 4$  with only  $p_1 + p_2$  may seem impossible.

However, the nature of the composites gives them increasingly complex structural and functional properties and potentials as sizes increase. Also recall that graphing  $\mathfrak{R}_\zeta$  (with  $s = 1/2$ ) visibly proves the primal relativity and relationship of primality and duality (etc.). Graphing  $\mathfrak{R}_\zeta$  with  $\zeta(1/2)$  also exhibits the relativity of dyadic primality reflected with  $-2n$  of the  $\text{Re-}$  half of the number line (in  $C^\infty$ ) and primal values represented on the line of symmetry, at  $\text{Re+}$  at  $1/2$ . Thus, it proves the dyadic numeric logic of  $1/2$  and its reciprocal identity,  $-2n$ . That supports the primal relativity of primality and duality intrinsic to  $\{\mathbf{N}\}$ , thus to all  $2n$  (of  $S_{N_e \rightarrow \infty}$ ). In other words, as proved above (with the **POP**, etc.), no matter how long  $S_{N_e \rightarrow \infty}$  is continued, numeric logic will never change the enabling principles, properties, and potentials of  $2n$  (etc.).

In fact, the [paper](#) (Veg 2016) on **GC** by René van der Vegt<sup>[?]</sup> verifies the realities and estimated potentials of composition with Goldbach pairs, GP ( $p_1 + p_2$ ). Of course, we like reliable certainty more than probability. Yet, finding ultra-large quantities of GP  $2n$  (even potentially) out to

hyper-colossal values (far beyond  $10^{18}$ ) offers impressive support for metalogical proof. Color-coded graphs help, but Kurzweg's paper<sup>[7]</sup> shows the realities and potentials with precise ratios and relations. (Kur 2016) He realized that

“What is quite clear from these results is that GP increase as a power of  $N$ , meaning that for  $N \geq 12$ , for which the  $N = 6n \pm 1$  forms apply, we will have at least one Goldbach Pair available to confirm Goldbach's Conjecture. When this fact is taken into account together with the list given at the beginning of this article, it is clear that the Goldbach Conjecture is true for all even numbers  $N$ .” – U.H. Kurzweg, from [Goldbach Revisited](#)

Thus, though he says nothing of enabling principles or why  $S_{N_e \rightarrow \infty}$  must always enable GP, Kurzweg's results relate directly to the proof of the TPC (and RH). For, as shown by Kurzweg's 6-axis hexagonal 'spiral' of the numbers, we can express logical proof with

$$\begin{aligned} \{6n\} \supset \{2n(3n)\} &\therefore \forall p_n \in S_{N_e \rightarrow \infty} \exists 6n \pm 1 = p_n > 5 \text{ and} \\ &\therefore \exists \{\text{NDR} \wedge \text{PRC} \wedge \text{POP}\} \Leftrightarrow \{2n \in S_{N_e \rightarrow \infty}\} \subset \{\mathbf{N}\} \dots \\ &\therefore S_{N_e \rightarrow \infty} \in \{\mathbf{N}\} \subset \{\mathbf{P}_m\} \in \{\mathbf{U}_R\}^\infty \text{ and} \\ &\therefore \{6n\} \wedge \{2n(3n)\} \Leftrightarrow (6n \pm 1 = p_n > 5) \Leftrightarrow \text{GP} \equiv \{2n = p_1 + p_2\}^\infty \\ &\therefore \text{GC} \equiv \text{T}_L \wedge \text{T} \blacksquare \end{aligned}$$

In other words, hexality makes all  $6n$  a super-set of set  $\{2n(3n)\}$ . Therefore, all primal values  $p_n$  (greater than 5) in  $S_{N_e \rightarrow \infty}$  are  $6n \pm 1$ ; and, because the 'rules' of natural distribution and proportional relative change and the principle of permanence exist, they enable and imply the realities of dyadic nonprimals  $\{2n \text{ in } S_{N_e \rightarrow \infty}\}$ , as a subset of  $\{\mathbf{N}\}$ . So, those realities imply and confirm each other. Therefore,  $S_{N_e \rightarrow \infty}$  expresses its enabling numeric logic,  $\{\mathbf{N}\}$ , a subset of enabling metalogical principles, the fundamental elements of universal reality (to the power of infinity). Therefore, logical numeric expressions of hexality  $\{6n\}$  and its constituent  $2n(3n)$  imply  $(6n \pm 1 = p_n > 5)$ , which implies the identity of GP as  $\{2n = p_1 + p_2\}$  is infinitely reliable. Thus, GC is strictly equivalent with logical theory and truth. QED.

That metalogical proof seems sufficiently elegant and deeply explanatory. Yet, the hexagonal graph lets us see the intrinsic relations, potentials, and logical limits of  $(6n \pm 1 = p_n > 5)$  and  $\{\mathbf{N}\}$ . It visibly verifies the pervasive formal, structural, and functional power of numeric logic and hexality. The relativity enabling its relationship with primality and duality (and triality) confirms it as an essential organizing principle enabling all  $2n$  in  $S_{N_e \rightarrow \infty}$  and  $\{2n = p_1 + p_2\}$ , the GPs, and their properties, possibilities, and potentials.

In fact, as shown in the closely related proof of the TPC, all the relations and principles visibly expressed and implied by Kurzweg's 6-axis map are equally significant and meaningful. For example, it shows that the results of doing  $S_{N_e \rightarrow \infty}$  or of using the RCP, or  $\mathfrak{R}_\zeta$  with  $(s) = 1/2$  are not spooky flukes of impossibly illogical maths. They show us the relationship of geometry, maths, numbers, and semiotics. It shows us another visible proof that nature's metalogical principles enable and sustain the numeric logic of  $n$ ,  $2n$ ,  $6n$ , and  $p_n$  (as intimately interrelated, inseparably interdependent realities). They are as inherently reciprocal as the identities of  $-2n$  and  $1/2$  (shown by graphing  $\mathfrak{R}_\zeta$  with  $(s) = 1/2$ ).

It also helps to recall that nothing in the universe can change the integrity and constancy of the logical and metalogical principles enabling it and the complexity, regularity, reciprocity, and potentials of  $\mathfrak{R}_\zeta$  and **GC**. For example, graphing  $\mathfrak{R}_\zeta$  with  $(s) = 1/2$  directly implies and verifies the primal interdependence of  $p_n$  and  $2n$  as expressions of the logical relativity of primality and duality. That pervasive relativity also enables additive composition of  $p_n > 5$  with at least one GP ( $p_1 + p_2 = 2n$ ) of  $\{2n \text{ in } S_{N_e \rightarrow \infty}\}$ .

So, we can now understand that the previously mysterious relationship of **GC** and **RH** (and **CC** and the **TPC**) is the result of numeric logic and its enabling metalogical principles. Now, if that claim is true (despite the decreasing quantity of primals  $p_n > 5$ ), as the quantities and sizes of dyadic  $2n$  in  $S_{N_e \rightarrow \infty}$  increase, per the **PRC** or **NDR** then—as surely as the **POP** lets  $\zeta(1/2)$  put all symbolic zeros exactly and only on the line of symmetry (and  $-2n \rightarrow -\infty$ )—numeric logic and enabling metalogic ensure sums of  $2n \rightarrow \infty$  with GPs.

Now, the proof of the **TPC** may not look simple but, like the foregoing proofs, it relies on the natural principle of simplicity. Yet, like Euclid’s logical proof of the possibility of an infinite quantity of primal numbers, perfect proofs require absolute certainty. Tomas Oliveira e Silva’s brute force verification of Goldbach partitions, to  $2n > 4 \times 10^{18}$  [?] supports this unconditional proof of **GC** and the principles that enable  $2n^\infty$  and  $GP \rightarrow \infty$  (and the reversibility of the **CCP** with **CPR**) and the perfect proof of **CC**. So, doubting reliable processes, progressions, and complex functions provides no good reasons for doubting how they might “behave” after some magnitude  $M \rightarrow \infty$  of  $n$  (or  $6n$  of  $\{p_a, 6n, p_b\} \rightarrow \infty$ ). QED.

Now, obviously, proving the **TPC** can use much of the elements and metatheory used in the proof of **GC**. For example, the inverse relations of hyper-colossal primals and ever more hyper-colossal hyper-composites is an expression of **PRC**, proportionality, relativity, regularity, and constancy. So, the quantity of hyper-composite  $2n$  and  $6n$  increases in proportion with magnitude and size. The numeric relativity and proportionality also make additive composition of  $6n$  with GP ( $p_1 + p_2$ ) far more likely than for  $2n$ . The power law, the **POP** (logical permanence), and the other enabling principles also cause and sustain the relationship of primals  $p_n > 5$  and all  $6n$ , because of the permanent constancy of the enabling metalogical principles (of form, structure, functionality, relativity, actuality, etc.).

Yet, reliable unconditional proof of the **TPC** may still seem to require more than the facts and metatheory of numeric logic. After all, the above proofs present no specific evidence showing how and why there could be an infinite quantity of primal couplets in  $\{p_a, 6n, p_b\}$ . So, the goal of this proof is showing why the enabling principles ensure the possibility of  $\{p_a, 6n, p_b\}$ , no matter how far the progression of  $S_{N \rightarrow \infty}$  might be continued. That implies a logical complement, proving why there is nothing preventing an infinite quantity of primal couplets in  $\{p_a, 6n, p_b\}$ .

As shown by Kurzweg (and vast computational evidence), the relationship of **GC** and the **TPC** is as direct and constant as the relativity of primality and hexality. We also know that the quantity of primals decreases in inverse proportional relation to the increasing quantity and intrinsic complexity of  $2n$  as the sizes of nonprimals  $n$  and primals  $p_n$  increase. Yet, can we find a universally acceptable, verifiable disproof of the **TPC** or **GC**?

Clearly, disproving the currently accepted version of **GC**,  $2n > 4 = p_n + p_x$  (where  $p_n \neq 1$ ) requires only that we find a single  $2n > 4$  that cannot be composed as a sum of 2 primals  $\geq 2$ . Yet, for **GC** (the **TPC** and **RH**), after trillions of tries, unreliable principles seem as unlikely as finding just a single cause that can change a principle.

However, despite the nonlinear proliferation of GP and increasing intrinsic complexity of  $2n$  and  $6n$  (as  $S_{N \rightarrow \infty}$ ) could the decreasing quantity of  $p_n$  doom **GC** and the **TPC** to invalidity?

That questions the metheorem of intrinsic metalogical relativity of numeric logic, numbers, and their constant relational potentials and limits. Now, if the Prime Number Theorem (PNT) remains viable, the minimum density of primals can remain close to 1.32 or even worse,  $\geq 1$  (as  $S_{N \rightarrow \infty}$ ). Also, if the limiting value of  $X$  really equals  $\pm$ double the twin prime constant (*TPC*, per the Hardy-Littlewood theorems), then **GC** and the **TPC** (and **RH**) remain durably plausible, if not unconditionally proven true.

Yet, we need to remember that 1.32 and the presumably exact doubling of the *TPC* must be effects of causes, principles of numeric logic and their enabling metalogical principles. It should now be obvious that primordial unity, integrity, relativity, primality, primal duality, triality, and hexality are not fanciful concoctions or accidents of cosmic magic. Therefore, as long as the distribution and density ( $D_p$ ) of primals (and primal couplets) in sets  $\geq \{11,12,13\}$  in  $S_{N \rightarrow \infty}$  remain above  $D_p \geq 1$  (or even at  $\pm 1$ ) over the asymptote, then disproving either **GC** or the **TPC** (and **RH**) becomes increasingly unlikely.

That is so because the rate of decrease declines in inverse proportion as the magnitudes of  $n$  in  $S_{N \rightarrow \infty}$  increase. In fact, as is well-known, nearing the asymptote, the decrease of  $D_p$  (of  $p_n$ ) slows to a crawl. That is a direct, functional expression of the principles of symmetry and asymmetry, relativity, reciprocity, regularity, and irregularity enabling and sustaining the relationship of the primal and nonprimal values of  $S_{N \rightarrow \infty}$ . So, with logical and technical verification out to trillions of ultra-colossal values of  $n$ ,  $p_n$ , GP, and  $\{p_a, 6n, p_b\}$  reasons for suspecting either  $D_p = 0$ , or that the asymptote could ever drop to  $y = 0$ , are as unlikely as something unknown changing the rules of maths, progressions, functions, or the enabling principles.

Why should that not happen? Obviously,  $D_p$  could only fall to 0 if  $S_{N \rightarrow \infty}$  and  $Re+$  ran out of primals, leaving nothing but an infinity of composites. That proved impossible, and nobody can disprove Euclid's proof of primal infinity (without absurdities). Of course, on its own, primal infinity fails to ensure an infinity of primal couplets framing a  $6n$ , or whatever. Yet, prior to this project, nobody explained

- a) why only 1 couplet is centered on 4, the first primal square ( $2^2$ ), nor
- b) why the 2<sup>nd</sup> couplet  $\{5,6,7\}$  and all subsequent couplets relate so intimately to  $6n$ , nor
- c) why the first nonprimitive couplet is centered on 12 ( $4 \times 3$  or  $2 \times 6$ ), nor
- d) why  $p_n$  singlets (not fraternal twins) are all  $6n \pm 1$ .



More importantly, we should ask, “why do any conjectures and theorems involving primality, progressions, infinite series,  $2n$  and  $2$  (and the other primitive primals) exhibit so many logical relations, relativities, symmetries, and complementary asymmetries?”

The answer requires examination of the principles enabling and sustaining the identities and relationships that make functions, progressions, theorems, and conjectures possible and true, or at least highly plausible. We first need a search for enabling metalogical principles or proof that none exist. However, recall that—on their own—the PNT, TPC, vast computational verification, and numeric logic do not prove the TPC. Yet, we need to reject the silly notion that the vast quantities of logical, structural, and functional realities, results, and factual evidence are simply accidental, illogically causeless coincidences. With open minds our search can then succeed.

Now, first, we see the primacy of the primal numeric symmetry of all products of  $2n$ . They are clearly relative to unity and all other expressions of numeric primality. A good example of that is the amazingly revealing symmetries expressed and implied in the discoveries related to the couplets in  $\{p_a, 6n, p_b\}$  and the “Twin Prime” theorem (TPT):

“Every twin prime pair except (3,5) is of the form  $(6n - 1, 6n + 1)$  for some natural number  $n$ ; that is, the number between the two primes is a multiple of 6.”(Wik 2016)

The TPC says there may be infinitely many primal pairs in  $\mathbf{N}$ . That has been verified with trillions of examples. Yet, is it somehow possible that all primal couplets  $> (5,7)$  are centered on  $6n$  by illogical coincidence? No, trillions of instances are something more than 2 coincidental accidents of random chance. Even several examples could be accidental, but not trillions.

Nor could it be a causeless accident that we find only 3 different types of recurrent patterns of  $d_f$  of the nonprimals surrounding the primal couplets ( $pc$ ) and their central  $6n$ . For example, consider the numeric logic and enabling metalogic that puts  $p_n$  with least significant, final digits  $d_f$  1 or 3, or 5 or 7, or 9 before and after all the  $2n$  before and after all  $pc$  (in  $S_{N \rightarrow \infty}$ ). Also recall that all  $pc$  having  $6n > 6$  between  $p_1$  &  $p_2$  proves that generating  $S_{N \rightarrow \infty}$  always enables only 3 kinds of numeric neighborhoods. Thus, we see 3 kinds of  $pc > (3,5)$  showing only 3 patterns of  $d_f$  and their nonprimal neighbors have  $d_f$  typical of the 3  $pc$  group patterns of  $d_f$  (intrinsic to their neighborhood of numbers).

Consider the first set of  $pc$  group type a,  $\{4,5,6,7,8\}$  (GTa<sub>0</sub>). As the first and only primitive  $pc$  group centered on 6, it is unique, with  $p_1 = 5$  (instead of having a  $d_f$  of 9). All subsequent type A groups (GTa) are centered on  $6n$  that are also multiples of 5 or 10, with  $d_f$  of 0. Naturally, the  $d_f$  of  $p_2$  of those GTa will always be 1. So, on either side of those  $pc$ , we see  $d_f$  8 and  $d_f$  2.

So, naturally, sets of  $pc$  group type b (GTb), like  $\{10,11,12,13,14\}$ , always have  $p_1$  with  $d_f$  of 1 and  $p_2$  with  $d_f$  of 3. In sets of  $pc$  group type c (GTc), like  $\{16,17,18,19,20\}$ , we always see  $p_1$  with  $d_f$  of 7 and  $p_2$  with  $d_f$  of 9. Clearly, the position and casual relativity of  $6n$  in all 3  $pc$  group types and neighborhoods is as essential as it is provable.

For example, if quintillions of those 3 patterns fail to inspire certainty, consider deeper evidence of numeric structural and relational logic that enable and sustain the nature of all  $\{p_a, 6n, p_b\}$  and

the 3 kinds of neighborhoods that enable and sustain them. First, we need to recall that the logical nature of  $\mathbf{N}$  (and set  $\{\mathbf{N}\}$  of all whole numbers and principles of numeric logic) can be studied with summary digital reduction (SDR). SDR lets us reduce any nonprimitive integer to a single digit sum. It also reveals patterns of the intrinsic logic enabling numeric identities and patterns.

So, in GTa we see that SDR shows us a distinctive logical signature by reducing the numbers of its first *pc* subset  $\{29,30,31\}$  to their logical single digit identities ( $\mathbf{I}_d$ ), repeating the process for a single digit result. That gives us (2,3,4) because, per SDR,  $2 + 9 \equiv 11 \equiv 2$ , and  $3 + 0 \equiv 3$ , and  $3 + 1 \equiv 4$ , then  $2 + 3 + 4 \equiv 9$  (the  $\mathbf{I}_d$  of the central subset of GTa). So, using SDR, we also find that the third GTa subset,  $\{59,60,61\}$ , reduces to  $(5,6,7) \equiv 9$ . SDR also lets us see  $\{6299,6300,6301\}$  giving us  $(8,9,1) \equiv 9$ . In fact, all GTa *pc* subsets have  $\mathbf{I}_d 9$ .

Now, consider the  $\mathbf{I}_d$  of the whole groups of GTa, first, set 2,  $\{28,29,30,31,32\}$ . Naturally, using SDR, we first get (1,2,3,4,5); and that gives us  $\mathbf{I}_d$  of 6 for that local GTa neighborhood. Yet, for the next GTa set,  $\{58,59,60,61,62\}$ , we get (4,5,6,7,8), which shows us its  $\mathbf{I}_d = 3$ . SDR with group  $\{148,149,150,151,152\}$  gives us (4,5,6,7,8), for  $\mathbf{I}_d = 3$  again. Now, if we check  $\{178,179,180,181,182\}$ , we get (7,8,9,1,2), then  $\mathbf{I}_d = 9$ ; and for  $\{238,239,240,241,242\}$ , we find (4,5,6,7,8) again and  $\mathbf{I}_d = 3$ .

In fact, regardless of the intermediate reductions, the only 3 GTa  $\mathbf{I}_d$  are 3, 6, and 9; and the  $\mathbf{I}_d$  of their central *pc* subset is always 9.

Using SDR for GTb *pc* subset  $\{11,12,13\}$ , we get (2,3,4) and  $\mathbf{I}_d = 9$ . For its subset 2,  $\{41,42,43\}$ , we get (5,6,7) and  $\mathbf{I}_d = 9$  again. For  $\{71,72,73\}$  we get (8,9,1) and  $\mathbf{I}_d = 9$ . Checking  $\{101,102,103\}$  and  $\{191,192,193\}$  and  $\{281,282,283\}$  and  $\{10091,10092,10093\}$  give us (2,3,4), and  $\mathbf{I}_d = 9$  again. Now, consider the first local neighborhood of GTb,  $\{10,11,12,13,14\}$ . Summing the digits of each element gives us 1, 2, 3, 4, and 5, then they reduce to  $\mathbf{I}_d = 6$ . For GTb set 2,  $\{40,41,42,43,44\}$ , we get the intermediate (4,5,6,7,8) sequence again, and  $\mathbf{I}_d = 3$ . Checking  $\{70,71,72,73,74\}$  gives us (7,8,9,1,2), for  $\mathbf{I}_d = 9$ . Again, the only  $\mathbf{I}_d$  of the local neighborhoods of GTb are 3, 6, and 9.

For GTc *pc* subsets we can start with  $\{17,18,19\}$ , to get (8,9,1) and  $\mathbf{I}_d = 9$ . Now, for  $\{107,108,109\}$ , SDR gives us (8,9,1), but  $\{137,138,139\}$  reduces to (2,3,4) yet, again,  $\mathbf{I}_d = 9$ . However, at GTc  $\{347,348,349\}$  SDR reduces it to (5,6,7) but, still,  $\mathbf{I}_d = 9$ . Of course, we should check the  $\mathbf{I}_d$  of the GTc groups, starting with  $\{16,17,18,19,20\}$ , giving us (7,8,9,1,2) and  $\mathbf{I}_d = 9$ . Naturally, the same pattern and  $\mathbf{I}_d 9$  repeats at  $\{106,107,108,109,110\}$ , the 2<sup>nd</sup> GTc set, also at the 3<sup>rd</sup> and 4<sup>th</sup> GTc *pc* neighborhoods. At the 5<sup>th</sup> GT-c set,  $\{226,227,228,229,230\}$ , SDR shows us a 2<sup>nd</sup> pattern, (1,2,3,4,5), and its  $\mathbf{I}_d$  is 6. At the 6<sup>th</sup> set,  $\{346,347,348,349,350\}$ , we get (4,5,6,7,8) and  $\mathbf{I}_d 3$ .

Now, at every occurrence of  $\{p_a, 6n, p_b\}$ , the digital identity of each is always 9; and for all the *pc* (GTa, GTb, and GTc) the  $\mathbf{I}_d$  of each group of 5 numbers (centered on  $6n$ ) is always 3 or 6 or 9.

Clearly, those patterns and results are effects of causes: the locations (in  $\mathbf{S}_{\mathbf{N} \rightarrow \infty}$ ), the progression ( $n + 1$ ), the properties of the numbers, and the principles that enable it all. So, without further

analysis, using SDR proves that the nature of  $\mathbf{N}$ ,  $\{\mathbf{N}\}$ , and  $pc$  subsets  $\{p_a, 6n, p_b\}$  are enabled by principles (determining their potentials and limits), not by random illogic. This proof also makes it visibly obvious that all  $p_n = 6n \pm 1$  and  $GP (p_1 + p_2 = 2n) \rightarrow \infty$  are direct evidence (of causal principles and properties), not mysterious oddities.

Thus, these results also prove the reality and reliability of the **POP** (principle of permanence), and nature of the logic and metalogic enabling and sustaining the numbers, processes, and maths that let us see and communicate the results of  $n + 1$  and graphing  $\mathfrak{R}_z$  with  $(s) = 1/2$ . Yet, the residual issues are severely critical to understanding definitive proofs and metaproofs of **GC** and the **TPC** (and **RH**). So, another meta-proof may help:

Metatheorem L:  $\{\mathbf{U}_R \supset \{\mathbf{P}_{ml}\} \supset \{\mathbf{N}\} \supset \{\{\mathbf{S}_N \rightarrow \infty\} \supset \{\mathbf{S}_{Np} \rightarrow \infty\} \wedge \{\mathbf{S}_{Ne/o} \rightarrow \infty\}\} \supset \{\{(p_n, 2n, GP)\} \cup \{p_a, 6n, p_b\}\} \therefore$   
 $\therefore \exists \{\mathbf{P}_{ml}\} \wedge \mathbf{POP} \wedge \{\mathbf{N}\} \wedge (n + 1) \therefore (p_n, 2n) \rightarrow \infty \exists \{\{6n\} \supset \{\{2n\} \cup \{3n\}\} \rightarrow \infty \therefore$   
 $\therefore \mathbf{RCP} \wedge \{\mathbf{N}\} \wedge \{\{\mathbf{S}_N \rightarrow \infty\}\} \wedge \mathbf{POP} \equiv \mathbf{T} \subset \{\{\mathbf{N}\} \wedge \{\mathbf{P}_{ml}\}\}$  and  $\therefore \exists (p_n, 2n, 3n, 6n) \rightarrow \infty \dots$   
 $\therefore \{\mathbf{GP} \wedge \{(6n \pm 1 = p_n)\}\} \supset (p_a, 6n, p_b) \subset \{pc (GTa, GTb, GTc)\} \wedge \{\{\zeta(1/2)\} \cup \{0\}\}$  and  
 $\therefore \mathbf{TPT} \wedge \mathbf{TPC} \wedge \mathbf{GC} \wedge \mathbf{RH} \wedge \mathbf{CC} \equiv \mathbf{T} \subset \{\{\mathbf{N}\} \cup \{\mathbf{P}_{ml}\} \cup \{\mathbf{U}_R\} \therefore$   
 $\therefore \exists \{\{\mathfrak{Z}((y_n, x_n) = n^2) \Rightarrow 2:1\} \wedge \{\mathfrak{Z}((y_n, x_n) = \boxplus n) \Rightarrow 3:1\}\} \therefore (p_a + p_b) = 12n \rightarrow \infty \blacksquare$

Translation: Universal reality can be thought of as the super-set of all its enabling metalogical principles, the super-set of the principles enabling the nature of numbers and numeric logic  $\{\mathbf{N}\}$ , the super-set of potentially infinite sequences and additive progressions (of  $n + 1$ ).

Functionally, they are the super-set of all their numeric elements enabling the union of all primal and dyadic values and Goldbach primes (equalling  $2n$ ) with the primal couplets (centered on  $6n$ ). Thus, because of the primal metalogical principles and the principle of permanence and the nature of numeric logic and additive progressions, therefore, the groups of primal and dyadic numbers are infinite. So, numerically, 6 and its multiples are the super-set of 2 and 3 and their multiples (in a multi-set union expressing the integral union of primal duality and trinity, enabling, and sustaining hexality).

Thus, because the reverse Collatz process and  $\{\mathbf{N}\}$  and the infinite additive progression (of  $n + 1$ ) and the principle of permanence are strictly equivalent with truth,  $\mathbf{T}$ , [and, logically] it is a subset of numeric logic and its enabling metalogical principles – and because there are infinities of  $p_n$  (primals),  $2n$ ,  $3n$ , and  $6n$  (in  $\mathbf{N}$  and  $\mathbf{S}_N \rightarrow \infty$ ) – therefore, the GP primals and the infinity of primals related to 6 (and its multiples) are a super-set of the primal couplets  $(p_a, 6n, p_b)$ .

Naturally, being expressions of the integral principles of numeric logic, they are also subsets of the principles that enable the logical relations and patterns we see in all the 3 types of numeric groups centered on  $6n$  and that also enable  $\mathfrak{R}_z$  with  $(s) = 1/2$  and its patterns of symbolic zeroes.

And, therefore, the “twin primes” theorem and “twin primes” conjecture and Goldbach’s conjecture and Riemann’s hypothesis and Collatz’s conjecture are strictly, logically equivalent to truth, a subset of the super-set of **a**) numeric logic’s union with its **b**) enabling metalogical principles and their permanent union with the actualities of universal reality.

Thus, due to all the enabling principles, the map of  $\mathbf{N}$  (in Fig. 1b) and the lines through the upper right corners and centers of the squares (above the bisector and baseline of all  $n \rightarrow \infty$ ) are

valid, showing the reliability of  $\{\mathbf{N}\}$  and the principles enabling it. Therefore, the sum of adding the 2 primals of any  $\{p_a, 6n, p_b\}$  always gives us a multiple of 12 ( $2 \otimes 6n$ ). QED.

Now, just as it is no accident that summing any primal couplets gives us a resultant  $12n$  (unique to the 3 kinds of  $pc$  sets and local groups), it is no accident that the  $6n$  intermediaries and their surrounding composite neighbors are all expressions of reliable causal principles and processes that determine the locations of each subsequent primal  $p_n$  and  $pc$ . Logically, taken altogether, the primal pairs and their neighbors (and relatives) reveal the logical and metalogical principles enabling the infinite reliability of the nature of  $\{\mathbf{N}\}$  and its expressions (and the truth of the **TPC** and **TPT**). Also, the primal couplets clearly serve as landmarks on the way to mapping the rest of primal infinity, and as tools for developing better number theory.

■

Obviously, we could see the 3  $pc$  group patterns repeated trillions or sextillions of times, yet only because of the changeless principles that enable the properties, relations, and potentials of the 3 kinds of odd and even neighbors in the local  $pc$  group (determined by  $\{\mathbf{N}\}$  and its nature). So, this meta-proof clearly describes, proves, and verifies the results of the realities, processes, and principles enabling the proofs (including cardinality, ordinality, and mentality). Of course, they also enable and sustain information, numbers, maths, the complex plane, theory, and science. So, we also have another verification of the truth of the **QPIT**, which clearly verifies the validity of this meta-proof of the principles enabling  $\mathfrak{R}_z$  and **RH**.

### 3. Discussion

#### 3.1 Commentary

As long foreseen by great mathematicians, the nature of the deep structure of maths enables the truth of **RH**, shown by the graphs and supporting proofs. Clearly, uncertainty about **RH**, the **TPC**, **GC**, and **CC** existed because the nature of numbers (and maths) was not fully understood because the necessary metatheory was absent. So, the infinite quantities and existence of 3 kinds of nonprimitive primal couplet ensembles remained unrecognized or ignored and undiscovered while investigating **RH** using only technical operations, algebras, and/or calculus.

Riemannian geometry, maths, and maths theory are elements of mathematical logic and  $\{\mathbf{N}\}$ , all enabled by semiotics and operational metalogic. They also exist because of mentality and the other functional principles of being. Of course, they are enabled by the principles of form and structure. All of them are equally essential constituents of primal unity and its infinite integrity. So, as proven and confirmed with the **NDR** and **PRC** (etc.), valid metatheory is based on and expresses actual realities and enabling principles of being, falsifiable only with fallacies.

So, unless reality and maths are results of supernatural magic, any argument against the truth of the proofs, new theory and metatheory must be proven with superior logic and at least one unconditionally provable example invalidating them. Likewise, any disproof of the existence and primacy of natural metalogical principles would require superior metatheorems, supported

by superior metatheory of some other reality. Yet, in this universe, regularity, and changeless enabling principles persist, constantly. So, obviously, without actual causes, other realities and sustaining principles remain nonexistent.

We may never know exactly why the pioneers of metamaths failed to see their disputes and disagreements as ‘concrete’ evidence of fundamental illogic, deficiencies of knowledge, thought, and language. However, clearly, the logical and metalogical principles, graphs, and proofs presented here enable resolution of the factional stalemate that prevented earlier proofs (of **RH**, etc.). The same is true of all the Clay challenge prize problems. However, even ordinary logic makes it obvious that a viable metatheory of maths needs logical integrity down to the roots of the metatheory, semiotics, numbers, maths, geometry, and trigonometry.

So, for a major upgrade of the foundation of number theory, a deep understanding of primality, duality, triality, quadrinity (and squareness), tetrality, pentality, hexality (and senary logic), heptality (AKA septality), octality, nonicality (triadic primality squared), and decanality (etc.). Naturally, respect for simplicity is essential for mastery and real progress in maths, science, and society. Natural complexity and metalogical fractality are also important, but not more so than the logical and metalogical integrity of simplicity intrinsic to the totality of unity.

The supporting proofs make it seem likely that insufficient respect for simplicity and its dyadic relationship with complexity prevented an earlier upgrade and earlier absolute proof of **RH**. For example, Sir Michael Atiyah, a bright mathematician, created the best recent example of how not to resolve the **RH** problem. A few ‘unknown’ mathematicians and amateurs came much closer, but failed by not providing fully definitive, durably satisfactory proof. Fully satisfying unconditional proof required discovering, understanding, and explaining the enabling elements (principles) of numeric logic and the metalogical nature of numbers, maths, geometry, and trigonometry—unmentioned in other proofs.

So, without the essential elements, access to the best tools, rules—and the simpler, elementary methods Hilbert wanted—were simply unavailable.

Consider another example. Roberto Violi’s recent paper<sup>[2]</sup> on indirect technical verifications of **RH** is impressive, yet remains insufficient. The verification is indirect because Violi used only conventional methods and semi-analogous functions to show nondecaying constancy at the line of symmetry. Like some unconditional technical proofs of **RH**, it describes what  $\mathfrak{R}_z$  does. Yet, those proofs reveal no ‘hidden truths’ of maths, like why  $\mathfrak{R}_z$  (using  $1/2$ ) can only put zeroes on the line of symmetry or at  $-2n$ .

Thus, like Violi’s verification, the technical proofs suffer **a)** deficient definability, **b)** deficient explainability, **c)** minimal logical sufficiency, **d)** questionable acceptability, and **d)** less than fully satisfactory resolution of the **RH** problem. Yet, Violi’s verification confirms this comprehensive proof of **RH** (etc.) and the ontological metatheory of maths and reality presented here.

Naturally, this also reveals the nontrivial deficiencies of any less holistic approach. Now, recall that form, structure, properties, and relations of the nonprimal numbers determine the exact

location of the primal gaps punctuating the multiple composite symmetries of  $\{S_{N \rightarrow \infty}\}$ . We see that clearly shown (symbolically) by the  $0$ s in the map of  $\mathfrak{R}_z$  (using  $1/2$  for  $s$ ). So, though  $\{S_{N \rightarrow \infty}\}$  begins with primality and the primacy of unity, the extension of primality of  $p_n > 7$  could never justify trivializing the nonprimal sequences by calling them “gaps between primes” (as if they were unrelated, useless accidents). In fact, every primal number beyond 2 is caused and enabled by the preceding nonprimal  $n$  in  $\{S_{N \rightarrow \infty}\}$ . That fact is symbolized by the  $-2n$   $0$ s of Riemann’s graph.

That graph and the integral complementarity and reciprocity of symmetry and asymmetry, and of primality (etc.) ensure the truth of **RH**. Yet, for more durable certainty, imagine that nothing causes the whole of maths to comply with constant enabling principles. Also imagine causeless change and accidental evolutionary mutation of numbers, functions, and processes can happen at any moment.

Of course, in that imaginary context, there can be no constantly reliable principles, potentials, and limits to sustain any regular form, structure, or functions of durable principles, entities, and identities, nor any regular cyclical processes describable by theory.

In such an unruly universe of totally chaotic fantasy, there could be neither reality nor unreality, no knowable things or definite existences, of numbers or anything else, no definite events or evidence. Thus, reliable predictions, verifications of theories, and sanity would be impossible. Even saying that much about a completely illogical universe would be doubtful, if anyone could exist to doubt anything. Also, that imaginary reality would clearly not be the one natural to this universe.

So, any doubt based on absurd speculation is unnecessary, and **RH** remains absolutely true. Yet, after centuries of confusion, illogical thinking and its causes are typical of most conventional examples, like the following:

“In contrast to most previous work on the subject, we will rely on a finite verification of the Generalized Riemann Hypothesis up to a bounded conductor and bounded height, rather than on zero-free regions. We apply a rigorous verification due to D. Platt; the results we obtain are both rigorous and unconditional.” – H.A. Helfgott (Hel3, 2014)<sup>[2]</sup>

It seems odd that a mathematician would claim unconditional proof of **GC<sub>T</sub>** (for all odd  $n$  being sums of just 3 primals) due to reliance on a technical verification of an unproven theorem (re: **RH** and its extensions). However, such absurdity is typical of much of the previous writing and thinking about **RH** and **GC**.

For perfect proof of **RH**, technical verifications of partial proofs and conditional theorems (about models, approximations, etc.) are only useful as supplementary supporting material. In fact, it seems most likely that absurd assumptions, preposterous assertions, weird illogic, and excess anomalies in the cultures of maths and the sciences are not caused by unreliable maths and functions, but by deficient or defective: 1) egos, 2) beliefs, 3) notions, 4) opinions, 5) theory, 6) metatheory, and 7) deficient or defective teaching of maths.

Clearly though, the true nature of maths and numbers, and their relationship with primality, oneness, twoness,  $1/2$ , reciprocals, symmetry, geometry, and trigonometry are as is, unchanged.

## 3.2 History

“The further a mathematical theory is developed, the more harmoniously and uniformly does its construction proceed, and unsuspected relations are disclosed between hitherto separated branches of the science.” – David Hilbert

Between 1999 and today, this work proved that Hilbertian statement true. For example, on the morning of September 11, 2017, I felt ready to start creating a new map of  $n$  in the “field” of  $N$ . I thought it might prove the reality of the metalogical principles and numeric logic that enable Riemann’s zeta function and **RH**. I also thought it could prove the **TPC** and **GC** perfectly true.

It did, and does much more. The graphic proof revealed what was intuited years before. Soon after, I stumbled upon a link in an article on metamaths and proof theory that led to the most potent realizations and conceptual tools. So, mapping  $N$  with  $\{S_N \rightarrow \infty\}$  confirmed the validity and significance of this project. Of course, proving the primacy of nature’s enabling principles can unify more than just the disintegrated branches of the science of maths.

It also proved that deficiencies of modern metamaths metatheory and proof theory led to illogical diversions and chronic deficiencies in number theory and set theory. As explained in the sections, above, the unfinished paradigm and logic of the world were prime causal factors of **RH** and the long history of failures. That was discoverable because my quest for knowledge and understanding of reality, life, and the world became a work of truly holistic ontology. In 2019, I also discovered that the project was as much about axiology as ontology, number theory, maths, phenomenology, etc. It was only in the last few months of work that the full scope, remedial potentials, and implications became self-evident.

Consider this, the issue historically considered most critical was whether **RH** is as reliable as the graph of  $\Re_z$  (using  $1/2$  for  $s$ ) as the virtual lines and zeroes get closer to infinity. Now, with trillions of verifications and proof that nothing can change the causal principles of maths and nature, we can wonder why nobody considered all the causes of the results. However, neither Hilbert nor his predecessors or successors saw either the possibility or critical importance of investigating the primal principles that enable numbers, maths, and reality. Hence, all prior work on **RH** and  $\Re_z$  suffered insufficient metatheory, definability, explainability, acceptability, and definitive proof.

Many others made incredibly fascinating, scientifically useful discoveries along the way, but without getting any closer to solving the problem. Now, it seems extremely odd that the right direction and methods were by-passed. That realization was probably possible because, for well over 50 years, my technical training, careers, and interests revolved mostly around art, sex, music, design, ecotecture, meditation, Buddhist philosophy, history, axiology, economics, information technology, and cryptography. I think that enabled what Leonardo DaVinci called *connexione*, connecting the dots with interdisciplinary research and development.

So, by 1999 it was obvious that, to prove **RH** true or false or undecidable, new ideas and questions were essential. Why the line at  $1/2$  and no other line is *the critical line* (of symmetry) seemed more more important than finding circumstantial evidence and technical support for **RH**. Just the possibility of  $\Re_\zeta$  generating symbolic zeroes on the line at  $1/2$  (and all those  $-2n$ ), forever, never elsewhere, was as useful as it was fascinating. Understanding why any zeroes are on those lines was clearly more important than looking for functional analogs, not only for satisfactory proof, but for understanding the nature of  $\Re_\zeta$  and the relevant maths.

After all, the original purpose of maths and science was the quest for knowledge and wisdom, enabling better understanding of universal reality, nature, and life. So, I kept wondering what  $\Re_\zeta$  and **RH** tell us about reality.

Clearly, **RH** asks if the infinite progression of results and the **0s** relate directly to the primal numbers and their seemingly chaotic disorder and seemingly random dispersion (among all the other very orderly numbers). **RH** seems not to ask if all those zeroes are the results of progression, symbolizing primal gaps in the orderly structure of all the nonprimals. Why not, and what else could cause the results? Does  $\Re_\zeta$  tell us anything about intrinsic constancy as the quantity and complexity of numbers and its results increase toward infinity? Yes, but can **RH** and  $\Re_\zeta$  really tell us anything about physics, cosmology, or ontology? If so, how and why?

The correct answers came to seem obvious, yet satisfactory proof clearly needed to be at least as absolute and reliable as Euclid's proof of primal infinity. Yet, for **RH**, only optimal proof of the reasons—the principles making  $\Re_\zeta$  and numbers what they are—could provide optimum explanation and durable satisfaction. That clearly required optimum proof and explanation of all the maths, metamaths, and number theory involved. Anything less permits the possibility of residual suspicion, of an unknown or unknowable cause of future deviance.

After 140 years of insufficient genius, a satisfactory solution clearly required absolute proof of reliability, ensuring—beyond a shadow of doubt—that Riemann's zeta function is not one of those functions that cause unexpected results (and ruinous embarrassment).

Studying cryptography, data compression, and logic architecture led to reading "*Music of the Primes*" (by Marcus du Sautoy). It prompted study of **RH** and the Goldbach conjectures. It also made it obvious that there was a deep connection between **RH** and **GC**. The long history of attempted proofs made them stand out as important landmarks on the way to understanding. Work on superior data compression and ultra-secure communication coding led to ever more research of number theory and semiotics. That led to study of *Principia Mathematica*<sup>[1]</sup> (PM) and **GIT** (Gödel's incompleteness theorem). In turn, that prompted extensive review of the ancient history and logical roots of maths, metamaths, physics, semiotics, and numbers.

PM is especially relevant as a prime example of the linguistic and semiotic nature of the core problem in conventional metamaths.

Resolving the vast swamp of conflicting notions, assumptions, and hypotheses plaguing metamaths was obviously necessary for discovering how to prove **RH** or anything else related



to the logical and metalogical principles that made it so fascinating and so difficult for so many brilliant mathematicians. Oddly enough, partial proof of that is PM's "proof" that  $1 + 1 = 2$ , requiring over 362 of pages of explanation.

Clearly, if the natural logic of being, form, structure, function, language, and their deficient sociocultural paradigm was well understood, Russell and Whitehead could have succeeded more concisely. They might even have equalled the genius of the ancients who created the base-60 number system (etc., nearly 4000 years ago). Yet, even with three editions, PM failed to resolve its core-level problem: the absence of viably holonomic metatheory of the logical and metalogical principles of maths.

So, at the beginning of this project, a holistic metatheory of maths and numbers was still unavailable. Nor had anyone fully explained the nature of the hardest problems of maths and their causes (at the level of metalogical principles). Hilbert and his successors never finished their programs. So, there was no definitive foundation of maths, the metatheory. Seeing that confirmed the potential of this approach, the new realizations, new theory, new metatheory, and results.

For example, the previous inability find an effective approach to solution (and the underlying principles) was clearly a problem of semantical and philosophical deficiency. So, it became increasingly obvious that obstacles were caused and enforced by the deficient sociocultural paradigm. Many examples exist, but the unnecessary cruelty, hardships, racist prejudice, and jingoistic chauvinism that helped kill Ramanujan serve as atrocious examples of the pandemic that hindered maths and science. Countless other examples are found in history as far back as the days of ancient Egypt, at the least. Hardy provided another, more ironic example:

Exposition, criticism, appreciation, is work for second-rate minds... It is a melancholy experience for a professional mathematician to find himself writing about maths. The function of a mathematician is to do something, to prove new theorems, to add to maths, and not to talk about what he or other mathematicians have done. ~ G.H. Hardy

Gauss would probably disagree. Per the true definition, the duty of a mathematician (or geometer) is discovering and explaining 'secrets' of the universe. Pure maths is not just doing puzzles and equations, or describing what and how things work. It can also show us why realities are as they are. Yet, by Hardy's time, being a professional maths 'expert' (paid for technical/academic work) kept them from doing their subliminal duty to themselves and us. Obviously, **RH**, **GC**, and the **TPC** (etc.) prove that optimum proof and explanation can require a vast amount of contextual research and writing. When it does, then that is part of the work of good maths and mathematicians.

Yet, maybe appreciating and supporting Ramanujan lowered Hardy's opinion of himself to second rate status, but he was wrong. Without relentless curiosity, open-minded exploration, contemplation, direct insight—and a willingness to do whatever it takes—meticulous technical work on theorems fails to produce great discovery, understanding, and useful explanation. Great breakthroughs are enabled by unbridled imagination plus intuition tempered by acutely logical rationality, and lots of hard work.

Also, adding anything new to maths is impossible without publication and adequate contextual support. Obviously, at the least, Hardy was limited by his beliefs and opinions. Instead of relentlessly searching for the causes of Ramanujan's abilities and his amazing results (which came from beyond and much deeper than the maths paradigm he expanded), Hardy settled for staying his course, respectfully.

However, from the start of this work, Ramanujan was a major inspiration and guiding light on the way to this result. However, initially, exploring the domain and dimensions of this project was too fascinating to be much interested in anything other than what directly supported discovery. Yet, being able to think and talk about what others had done, not done, and done incorrectly or partially was essential for discovering and explaining the metatheory required for understanding and proving **RH**.

It was also obvious that pure maths is essentially linguistic, but also as imperfect as any other language. So, Old Guard academics are hostile to disruptive truths and better theories. That was somewhat daunting. Yet, the possible benefits and potentials of new applications and a new era of science were progressively encouraging. They bolstered confidence and the sense of adventure and satisfaction.

In fact, the academic dogmas, misinterpretations, preconceived misperceptions, and what was being missed (or ignored) prompted increasing devotion to the work. So, it came to seem that it should be generally understood that inferior theories and self-defensive, self-deceptive interpretations are worse than wrong. PM and the long failure of Russell, Whitehead, Hilbert, and so many others are prime examples.

So, it now seems that, if not for **GIT** (Gödel's disproof of PM and deficient metamaths), PM may have spawned a long era of repressive metamaths, maintaining maths as The Word of a false god. Still, the post-**GIT** lack of progress—not finally defining, correcting, and extending the programs of Russell & Whitehead, Hilbert, and Gödel are historic proof of the tenacity of regressive conformity.

Of course, metamaths and successful work on **RH** stagnated not only because PM was wrong and **GIT** was right. As proved above, the factionalists were asking the wrong questions. They also underestimated or ignored the most important one, the "why" question. Why? They clearly failed to care enough about optimal definability and explainability, simply accepting insufficient theory and disputable proofs, by default, at the least.

However, asking why led to further research, to deeper levels of causal principles, toward a new paradigm. For example, **GIT** is true, but why does the nature of logic and mind make it so? What both part 1 & 2 of **GIT** proved exists within, yet beyond and beneath the foundation of maths and its systemic logic. **GIT**'s deepest enabling principles are at the root and source of nature's primal metalogical principles.

So, it was soon easy to see that any axiom, however basic, is based on antecedent realities and the intrinsic principles that enable them. For example, recall that "axiom"—whether we

consider its ancient original meaning or more modern connotations—was an ancient Greek label for what many now take for granted as “laws” of nature and maths. Yet, as linguistic constructs, axioms have linguistic constituents and existential principles. They make axioms, symbols, thoughts, and maths possible. Yet, earlier metamaths, PM, and **GIT** tell us nothing about the realities and potentials of primal metalogical principles. In fact, they tend to obscure them by making secondary and tertiary constructs and subsidiary logic seem more important or more practical, worthy of greater priority, interest, and funding.

That may be why Cantor, Russell, Whitehead, and even Hilbert, Gödel, and Church were unable to see what they were missing. However, to be fair, the post-Cartesian-Newtonian-Einsteinian thinking that complicated everything, confused nearly everyone. Not that Gödel, Church, and Hilbert were wrong, but their understanding of totality was limited by the same paradigm that kept Riemann, from looking deeper and searching longer for essential enabling principles.

Such realizations kept accumulating, exposing the nature of the real problem. The post-Dark Age mishmash of subverted ontology, inadequate philosophy, and deficient metatheory were clearly the main causes of the problems that defied solutions for so long. For it also came to seem a tragic accident of civilization that, with few exceptions, most great mathematicians either lacked sufficient interest or opportunities for studying the history of all world religions, philosophies, languages, and cultures.

So, most of the great minds of modern maths lacked the knowledge and skills sufficient for completing a holonomic foundation of maths. Thus, though Riemann was obsessed with the fascinating quest for how to best approximate the actual distribution of primal numbers in  $\{S_{N \rightarrow \infty}\}$  with a simple theorem or function, he lacked the prerequisites for proving his own hypothesis. Indeed, his relentless pursuits led away from understanding primality and the deep relations of the primals and the nonprimal numbers that fascinated Ramanujan (and enable all of maths).

However, a complete metatheory of the logic and natural metalogical principles of maths is beyond the scope of this paper. Yet, for interested readers, context sufficient for understanding **RH**, the generalized **RH**, and grand **RH** follow. First, reconsidering **RH** may be helpful:

*"...es ist sehr wahrscheinlich, dass alle Wurzeln reell sind. Hiervon wäre allerdings ein strenger Beweis zu wünschen; ich habe indess die Aufsuchung desselben nach einigen flüchtigen vergeblichen Versuchen vorläufig bei Seite gelassen, da er für den nächsten Zweck meiner Untersuchung entbehrlich schien."*

(translation) "...it is very probable that all roots are real. Of course, one would wish for a rigorous proof here; I have for the time being, after some fleeting vain attempts, provisionally put aside the search for this, as it appears dispensable for the next objective of my investigation." – Riemann's statement of the Riemann hypothesis, from (Riemann 1859). (Wik, 2016, March 14)

[In mathematics] the Riemann hypothesis is a conjecture that the **Riemann zeta function** has its zeros only at the negative even integers and the complex numbers when the real part is  $1/2$ .

The generalized Riemann hypothesis asserts that for every Dirichlet character  $\chi$  and every complex number  $s$  with  $L(\chi, s) = 0$ : if the real part of  $s$  is between 0 and 1, then it is actually  $1/2$ .” (Wik 2016, March 22)

It [*the grand RH*] states that the nontrivial zeros of all automorphic  $L$ -functions lie on the critical line  $1/2 + it$  with  $t$  a real number variable and  $i$  the imaginary unit.” (Wik 2016, March 22)

The modified grand Riemann hypothesis is the assertion that the nontrivial zeros of all automorphic  $L$ -functions lie on the critical line or the real line.” (Wik 2016)

In his *Problems of the Millennium: The Riemann Hypothesis*, Peter Sarnak summarizes **RH** rather well (except re: ‘trivial’ zeros):

RH is the assertion that all the zeros...are on the line of symmetry for the functional equation, that is on  $\Re(s) = 1/2$ . (Sar 2004)

Sarnak’s appreciation of the significance of **RH** was obvious, but 158 years of failure proved that proving **RH** required thinking beyond status quo maths. So, none of the work and books on **RH** (and numbers) deal with their cause or essence—principles, symbolism, and semantics—their nature and meaning. Since  $\Re_\zeta$  and **RH** were always a result of a desire to understand the nature of primal numbers the lack of interest in principles seems very weird. Yet, the failure to think more deeply about causal principles is still pandemic in academia, and not just in maths classes (and colleges).

It came seem that maths was turned into a virtual hyperbox of nested boxes of rational magic and mystery. Since before Riemann, brilliant adventurers enjoyed exploring the vast infinities of the many-layered walls and ceilings of the hyperbox. Yet, evidently, they never looked deeply into the layers of the floor and foundation (of metalogical principles).

Hence, the intellectual tools required for proving **RH** and building holonomic metatheory were unthinkable and seemingly as hidden as the foundation of semiotics, semantics, epistemics, and physics. Thus, previous explorers were haphazardly led around the boundaries and limits of maths, but only occasionally and briefly back down to a few of the deep fundamentals.

Exploring the floor and foundation of the hyperbox enabled seeing what other investigators of **RH** missed. It seems that while trying to solve interesting technical puzzles and climbing logical trees, the contextual forest seemed invisible or impassable. After stating **RH**, Riemann admitted as much. Since then, the metalogical roots remained mostly unexamined and misunderstood.

That ensured that all other attempts to find optimum proof of **RH** failed before they began. The daunted explorers then returned to more enjoyable adventures in the walls and ceiling of their box. Yet, all that was needed was a return to the basics, at the source of the logical roots. What worked (re: **RH**, etc.) was more extensive investigation of what enabled everything, principles.

However, obviously, the whole of axiomatic set theory—a subsidiary, subordinate domain of mathematical logic—was insufficient. Metalogically valid metatheory, dealing with the actual universal principles that enable logic and maths is clearly a necessity. For example, when we accept the pre-existent reality of being and its enabling principles, we realize that they enable subsidiary phenomena (such as individual beings and subordinate forms and types of logic, maths, etc.). Thus, nature’s intrinsic principles are primal metalogical constituents of being’s

supra-systemic logic. It enables the domains of systemic and practical logic that enable our lives, awareness, realizations, theorems, engineering, and technologies.

In spite of their brilliant, prolific, useful results, Cantor, Hilbert, their supporters and successors were wrong about several important elements of infinity, logic, and metatheory. Thus, the theory of maths and science (etc.) remained deficient, and relatively defective. For example, the pioneers and current champions of set theory and QM maths seem unconcerned about the critical problems and deficiencies that retard their progress to next paradigm theory and praxis, the post-modern phase of science and thought.

Now, lest it seem that ignorance or misunderstanding trivializes the scope of previous work by great mathematicians, let Peter Sarnak's musing highlight the prime point:

It would be interesting to compile the long list of known consequences (many of which are quite indirect) of *GRH* and *GLH*. At the top of the list would be the prime number theorem with a sharp remainder term, the connection going back to Riemann's paper. He gives a formula for the number of primes less than  $X$  from which the prime number theorem would follow *if one knew some deeper information about the zeroes of zeta.*(Sar 2004)

The added italics emphasize the heart of this holistic approach to proving **RH**. Riemann's focus on determining "the number of primes less than  $X$ " is no less relevant, as an example of the wrong approach. So, he never got close to acquiring enough information about zero and his zeros to understand them (and the other key elements enabling his zeta function, its potentials, the results) and the PNT.

Naturally, the "deeper information" Riemann and others ignored is in the deeper domain of numeric structural logic, metamaths, and meta-semiotics. The relevant information is that Riemann's zeros are symbols of relative absence. They symbolize and approximate the presence of primals, the primal gaps in  $\{S_N \rightarrow \infty\}$ . Clearly, understanding that, and proving or disproving **RH** requires understanding the metalogic of 0, 1, 2,  $1/2$ , unity, duality, reality, and the basis of maths and metamaths. That was not Riemann's intent.

If all that seems too complex or too simple to be true, reconsider Newton's comment on Nature's love of simplicity. Also recall that the scope of Riemann's worldview was limited as much by the lack of metamaths as by the deficient sociocultural paradigm of 1859. Now, we can see projective geometry as absolute proof of the logical and metalogical principles that enable and rule it (etc.).

"If I were to awaken after having slept for a thousand years, my first question would be: Has the Riemann hypothesis been proven?" – David Hilbert

That may seem baffling, but it should also seem incredible, and sobering. Yet, most pioneers and lovers of maths enjoy the game-like quest for solutions of its puzzles. Not the very difficult study and work required to understand its history and enabling principles. However, that led to discovery of the maps (figs. 1 a & b and 2) that visibly prove the intrinsic principles that enable and sustain numbers, geometry, trigonometry, and complex maths. Of course, they also provide visible evidence supporting the theory, metatheory, and explanation. Lacking that,

fully understanding **RH** was and is impossible.

Michael Lucas Monterey, Chairman, Ecotropos Institute  
Mail: 1430 Willamette St., Eugene, OR 97401, USA  
Email: michael@michaellucasmonterey.com

## **4. Notes & Sources**

Forthcoming