Article

A Quasicrystalline Language of "Primitive Units of Consciousness" in Quantized Spacetime

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Abstract

Through careful deduction, it becomes clear that information cannot exist without consciousness – the awareness of things. And to be aware is to hold the meaning of relationships of objects within consciousness – perceiving abstract objects, while enjoying degrees of freedom within the structuring of those relationships. This defines consciousness as language – (1) a set of objects and (2) an ordering scheme with (3) degrees of freedom used for (4) expressing meaning. And since even information at the Planck scale cannot exist without consciousness, we propose an entity called a "primitive unit of consciousness", which acts as a mathematical operator in a quantized spacetime language. Quasicrystal mathematics based on E8 geometry seems to be a candidate for the language of reality, possessing several qualities corresponding to recent physical discoveries and various physically realistic unification models.

Key Words: quasicrystal, primitive unit, consciousness, quantized spacetime, Planck scale, hard problem, E8 geometry, quasicrystalline language.

Introduction

There is much confusion among scientists regarding the idea that consciousness interacts with microscopic physical reality. Without deep subject matter expertise, many good scientists presume the idea of consciousness to be within the realm of philosophy and neuroscience. Indeed it is, but it is more fundamentally within the realm of Planck scale quantum gravity theory – specifically a microscopic first principles theory of everything. So to break the ice, we being this document with some comments by some of the titans of physics:

Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. — Erwin Schrödinger

The stuff of the world is mind-stuff. — Arthur Eddington

We do not find obvious evidence of life or mind in so-called inert matter…; but if the scientific point of view is correct, we shall ultimately find them, at least in rudimentary form, all through the universe. — J. B. S. Haldane

Mind or something of the nature as mind must exist throughout the entire universe. This is, I

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believe, the truth. — Julian Huxley

The laws of physics leave a place for mind in the description of every molecule… In other words, mind is already inherent in every electron, and the processes of human consciousness differ only in degree and not in kind. — Freeman Dyson

That which we experience as mind… will in a natural way ultimately reach the level of the wavefunction and of the 'dance' of the particles. There is no unbridgeable gap or barrier between any of these levels… It is implied that, in some sense, a rudimentary consciousness is present even at the level of particle physics. — David Bohm

How physical processes create a subjective sense of experience, or "consciousness", is unknown. David Chalmers calls this "the hard problem" [5]. The definition and even existence of consciousness is debated. The problem has been grappled with primarily by philosophers, neuroscientists and psychologists with little success over the last few decades [6-9]. We believe the hard problem may be a false question.

Many scholarly works have been published suggesting that fundamental physics related to quantum mechanics (QM) may play a role [towards solving the hard problem] [10-15]. However, little progress has been made, possibly due to the fact that mankind has not yet discovered a "microscopic first principles" theory of everything (TOE). QM and general relativity are not theories of everything. And there is no first principles TOE, i.e., a model with no plugged physical constants. The belief system and culture of pre-QM era institutional science is deeply embedded into our society, especially in the hard sciences. And one of the memes of this system is that consciousness is a phenomenon restricted to brains made of atoms. Unfortunately, this bias blocks serious academic work on ontological questions regarding foundational physics. Ontology, the inquiry into what reality is, seems to be the logical starting point for both the hard problem of consciousness and a first principles TOE. We propose a rigorous deductive approach to help scientists to think more critically about the most fundamental questions of reality.

1. What Does Scientific Observation Tell Us About the Nature of Reality?

1.1 Physical Reality Is Information

Einstein's theories indicate that matter is a form of bound up energy. Pre-QM era physics suggests energy is the potential for work. A potentiality, like a tendency, is informational. If all particles are a form of energy, and if we consider a frozen moment of reality (a "mosaic" of some unknown Planck length objects), then everything is the potential (information) for work because in each frozen Plank time moment, no work (change) is occurring. But what is "work" at this microscopic foundation of reality? We can discuss this using the related terms "force" and "energy". Of course, energy is the potential for work. And work for a fundamental particle is merely a change to its direction or rate of movement under a force, a form of influence causing this change. The reader may notice that this is circular and convoluted because we know there is an equivalency between mass and energy – and by extension matter. For purposes of making

this point more clear, we shall again refer to matter as "a form of bound up energy" and rephrase the definition of "energy" thusly: ***Energy is the potential for a change in the direction or speed of a particle, i.e., a "bound up quantity of energy".***

Reduced further: ***Energy is the potential for a velocity of a of a quantity of bound up energy.*** The circular nature of this unpacking of high school level classical definitions is a helpful way to realize that, fundamentally, reality is made of information not some absolute stuff that we label as mass or energy or even spacetime. The importance of belaboring this point is that realizing that reality is made of information requires us to conjecture what mind is perceiving the information, since all information is the stuff of mind.

Quantum mechanics speaks to the energy/mass = information idea in two different ways: First, it tells us that fundamental particles do not undergo continuous smooth movement from one location to the next. In fact, it tells us that motion itself does not exist. Instead, reality is a sequence of frozen frames, where a particle is here and then there, with no motion in between – like flashing one hundred sequential still photographs on a computer monitor to create the illusion of motion. Within each frozen frame there is no change or motion, there is only a change between two or more frames observed by the observer. There is no work occurring in the classic idea of what work is. It is pure information. Second, the most popular interpretation of quantum mechanics, the Copenhagen interpretation, teaches us a bold new ontology that is disturbing to some who have thought deeply about it. Until a conscious entity measures/observes a particle, it does not exist in the same notion of reality that our common sense indicates we live in. It requires us to question the very nature of reality. It is important to understand that this idea of an unmeasured particle having no position is not merely a result of our lack of knowledge of where the particle is. Instead, the particle exists in an informational realm called a possibility space, where it literally has no location.

Because of the cultural remnants of old Newtonian thinking, it is troubling for some scientists to admit that everything is made of information. The idea that there is some absolute "stuff" of matter or energy beyond the logical and elegant notion of pure information may come from a pre-scientific era story – a story of an atom or little absolute chunk of something created by a god from outside the universe. This religious idea is engrained into Western thinking, including much of academic scientific discourse, where it has morphed into a false distinction (definition) and two nonsensical words: "materialism" and "idealism" (the later means reality is made of information – the stuff of mind). The two words are used to distinguish between people who think that only physical stuff exists versus those who think reality exists within some sort of "cosmic mind space" as pure information. Materialists, though, are unable to say what energy is if not information. And, as far as we have found, no materialist can articulate exactly what they mean by "absolute stuff other than information". Interestingly, most professed materialists have not actually thought about this question rigorously and are only vaguely aware that they believe in some sort of little chunks of absolute stuff or some non-informational substance called energy. Indeed, they are usually unaware of the fact that they cannot define energy beyond being information. We should also be clear that everything is a story – a theory. We are not suggesting that the story of absolute stuff beyond information is wrong simply because it is known to have an origin that can be traced back to religious stories, such as a god from outside the universe creating the universe out of some form of "stuff". In fact, there are also spiritual type ontologies

from ancient Eastern stories that have great similarity to our model. The key is to update our stories to best fit the latest scientific measurements of reality. And all indications are that reality is "information theoretic".

Again, QM is very much an ontological theory because it posits (in the widely adopted Copenhagen interpretation) that reality is made of two primary things; (1) abstract waves of possibility, where particles do not exist in our common sense notion of reality until we observe/measure them and (2) the controversial idea of "particle", where some theorists say it is made of abstract information and others say it is some absolute non-informational thing. John Wheeler, in his "It from Bit" ontology [16], was one of the first titans of physics to posit that reality is made of information. 21st century physicists who argue that reality is made of information include, MIT's Max Tegmark. He points out that everything we observe about reality indicates it is made of information [17-18], specifically mathematics, and that to speculate on some other absolute stuff beyond information is forced and unnecessary, especially since there is no competing scientific definition of reality (energy) being something other than information in the first place.

Combining the idea that (1) the universe is made of mathematical information and (2) the idea that reality is composed of "pixels" of change (time) and length (space), leads us to the notion that at the smallest scale fabric of reality, there is an algorithm at play – one that must involve some primitive "conscious operator" to actualize possible information into observed and "physical" information.

1.2 Information Is a Product of Consciousness and Consciousness Indicates Freewill

To support the statement, "information is a product of consciousness", we must first unpack rudimentary definitions of "information" and "consciousness". The simplest definition of "consciousness" is to be aware of something. Awareness, even of self, comes about through observation, i.e., measurement.

So, awareness via observation is the defining action and quality of consciousness. Similarly, "information", i.e., meaning, which is always subjective, is both a product of the observation and a defining quality of consciousness. In other words, the state of being aware of something is itself information or meaning. And to be aware is to be conscious. At this foundational level, the terms "information", "awareness/consciousness" and "observation/measurement" congeal into an equivalency, where each word must be defined using the others. One can then generally state that information is perceived relationships between aspects of consciousness itself.

Here is an analogy to put this generalization into more concrete terms: A conscious mind can dream of itself as a child walking around an apple tree. Each new vantage point of the child transforms (from her perspective) the 3D tree into a new 2D image. The tree, the child and the 2D transformations of the tree are all three made of both information and the consciousness of the dreamer – two terms that merge meanings upon close inspection. In this analogy, the tree is a "base object" that the mind creates and remains unchanged in 3D but transformed by the child in the 2D view. The 2D transformations created by the dream-child can be organized into a stream

that behaves like time. And there can be matching rules, with degrees of freedom, so that each 2D picture relates to others like letters in a language.

Even though the child, the tree and the 2D transformations are all information or objects of awareness within the mind of the dreamer, they are also different types of information. The 3D tree is a base object created in the mind that doesn't change. Its purpose is to be stable and receive observations so that a meaningful sequence of snapshots of observation by the tree-circling child can occur. The child is a vantage point of the dreamer. The dreamer may also give her "freewill", where the child can behave autonomously – to surprise and teach the dreamer. Whether the freewill exists only within the subconscious mind of the dreamer or just the dream child is a false question since even if the child's freewill is "real", she and her freedom exist within the mind of the dreamer. In this case, it is ultimately the dreamer's freewill – as though the child is the dreamer filtering herself through a pattern of "blind" spots" or "holes" in a larger network of awareness in order to create more interesting self-interactions with other filtered "sub-consciousnesses" of itself. In this ontology, the child of our analogy is very unique with her own self-identity from the dreamer and any other filtered "sub-consciousness" of the dreamer, even though she is made of the dreamer's foundational consciousness and freewill. And finally, there is the product of the base object (tree) and the vantage points of the dreamer (the little girl) – able to be combined into language, i.e., order with degrees of freedom in how to arrange the 2D transformations of the tree. We propose that these three informational elements of mind/awareness are foundational to both human psychology and to the mechanisms by which the universe languages/thinks itself into existence starting at the Planck scale substructure of spacetime, where (1) base objects are (2) observed/measured generating (3) products of the observations of the base objects – the physically behaving letters of a quantized spacetime language

It's important to realize that the product of observation (information or awareness) is not deterministic. An observer can interpret the same measurement differently in two identical instances. The information interpreted by the conscious observer is a choice at a conscious or subconscious level. Therefore, freewill is a defining characteristic of consciousness because it not only chooses what to observe, but also the interpretations of those observations. We humans certainly choose or create our states of consciousness by choosing what to observe and how to interpret it even though our choices are highly influenced by the environment – the freewill of everything else. If there are Planck scale primary units of consciousness observing reality into existence at the "pixelated" substructure of spacetime, these same non-deterministic principles of freewill must hold. In order for the primary units of consciousness to have freewill and also form cooperative group patterns, they must collaborate on a fundamental level – knowing what one another are choosing – as though they were all part of the same emergent consciousness.

Princeton mathematician, John Conway and co-author, Simon Kochen, published "The Strong Free Will Theorem" in 2009 [19]. It rigorously reasons that, if humans have freewill, fundamental particles must also have a primitive form of freewill. For the growing community of scientists who have deduced that physical reality is "information theoretic", the above foundational deduction and unpacking of definitions requires a diligent ontological consideration that consciousness itself may be the ground of reality.

1.3 If Spacetime and Particles are Pixelated, Is There a Network of Planck Scale Conscious Observers Generating This Information?

Leading theoretical particle physicists assume spacetime itself is quantized. Theories, such as loop quantum gravity [20], which quantize spacetime, are called quantum gravity theories because they update the smooth non-discrete Einsteinian spacetime model with the knowledge gleaned from quantum mechanical experiments– data that strongly indicate time and space are "pixelated" into discrete units, like tiles in a mosaic, called the Planck time and Planck length.

We are not the first to deduce that there must be a conscious entities, i.e., observers at the Planck scale to observe information into reality. Werner Heisenberg said [21]:

> *Was [is] it utterly absurd to seek behind the ordering structures of this world a "consciousness" whose "intentions" were these very structures?*

Physics Nobel laureate, Frank Wilczek of MIT said [22]:

> *The relevant literature [on the meaning of quantum theory] is famously contentious and obscure. I believe it will remain so until someone constructs, within the formalism of quantum mechanics, an "observer", that is, a model entity whose states correspond to a recognizable caricature of conscious awareness.*

Andrei Linde, co-pioneer of inflationary big bang theory, said:

> *Will it not turn out, with the further development of science, that the study of the universe and the study of consciousness will be inseparably linked, and that ultimate progress in the one will be impossible without progress in the other?*

Physicist and author of Bell's Theorem, John Bell said:

> *It is likely that the new way of seeing things will astonish us.*

If the information of spacetime and particles is "pixelated", we can deduce that there should be a Planck scale network of primary units of consciousness observing it into existence , indeed observing itself into reality. Here, we define "reality" and "existence" as any information which is thought of by a consciousness.

1.4 Would Primary Units of Consciousness Use An Algorithmic Language with a "Hinge Variable"?

An algorithm with degrees of freedom is a language. We define language as the confluence of three things: (1) a finite symbol/character set, (2) ordering rules and (3) limited ordering freedom or "hinge variables". Hinge variables allow the symbols and rules of an otherwise deterministic algorithm to encode any information desired.

Because reality comes in discrete pixels that are ordered into the mathematical systems of nature, our work focuses on how vast numbers of primary consciousness units at the substructure of spacetime might self-organize, behaving as a language. Specifically, we are concerned with how they generate a finite character set and what the organizational rules and degrees of freedom would be for those symbols.

In order for primary units of consciousness to organize into an algorithmic language capable of generating the geometric information of physical reality, they would need to "agree" on how to generate symbols. Specifically, they would have to agree on (1) what to observe (we call this the "base object"), (2) a finite set of ways to observe the subsets or transformations of the base object (3) the interpretations of those observations – the symbols (I propose the interpretation to be equivalent to the vantage point. Each vantage point gives one interpretation) and (4) syntactical rules for combining the symbols with degrees of allowable freedom.

1.5 Examples of Symbols Generated by an Observer Using a Base Object

Reduced to its simplest form, information is always relationship. The simplest relationships are connection networks between two or more points. The following three thought experiments explain how consciousness can create a finite set of symbols (letters) from a base object (also existing within consciousness). You, the reader, are a consciousness, so you will be the observer generating the base object and symbols within your mind.

Graph Theoretic Example: Imagine 8 points in no space, much like a network of 8 friends (Fig. 1), where distance is irrelevant to whether one person knows another. In this network (called the "complete graph") of 8 points, picture that each "knows" or is connected to each of the other 7. In fact, label the 8 points with the names of 8 people who know each other. This is our "base object". Now, using the idea of the base object you are holding in your mind, observe a special or double connection between any 3 of the 8 points or people, where each of the 3 is connected to the other 2 in the subgroup you've selected. This new object is the product of your consciousness choosing to observe or create a subset of relationships derived from the base object. The object you created is a non-geometric symbol and can be used in a language with other symbols also derived from the complete graph of 8 points.

Geometric Example: Imagine the 8 points (vertices) of a cube. This is your base object, and it obviously exists in the abstract space of your mind. Now select various combinations of vertices of the cube and connect them, forming a finite set of geometric symbols.

Geometric Transformation Example: Imagine the 8 vertices of the cube and yourself as an observer living with the cube in a Euclidean 3-space. View the cube along any of its axes of symmetry in order to create a finite set of symbols that are perspective transformations of the cube from 3D to 2D. Each is a symbol that can be used in a language.

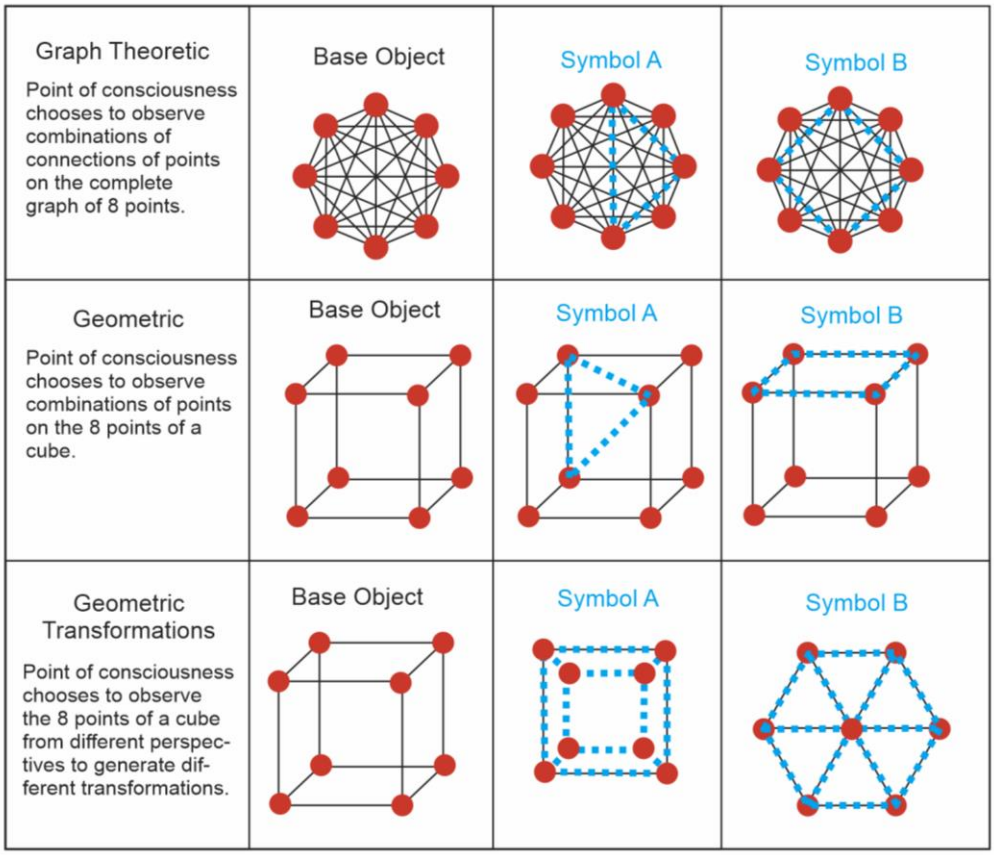


Figure 1. The base object and the symbols generated from the base object through three different methods: graph theoretic, geometric and geometric transformations.

Language is a good model for how pixelated units of collective consciousness would cooperate to act physically/mathematically. Below, is a discussion regarding our approach – a quasicrystalline language.

2. The Quantum Gravity Research Group Approach

2.0 Quasicrystal Algorithmic Language

Our group suspects that the algorithmic language of spacetime substructure uses quasicrystal (QC) mathematics. It is not within the scope of this document to go into detail, but the following non-mathematical overview of QCs may be of interest to the reader. We shall also provide a limited overview of several aspects of quantum scale reality that indicate nature itself may be a conscious quasicrystalline language.

QC mathematics were not available to Einstein or the pioneers of QM. In fact, they were only mathematically articulated in the 1960s and 1970s, starting with the inquiry of Hao Wang [23], which led to Roger Penrose discovering the simplest way to aperiodically tile the plane with only

two tiles in 1976 [24], the famous 2D QC known as the Penrose tiling with the ratio of the quantity of each of the two tiles being the golden ratio.

Things in nature are arranged in three general ways: Periodically ordered (like a crystal), seemingly random (like the grains of sand on the beach) and ordered but non-periodic. When a finite group of objects, such as water molecules (the "symbols") is organized in a repeating manner, as in ice, it cannot be said to be a language because the organizational rules have no degrees of freedom.

When water molecules are arranged in the classic theory of liquid water, they have very large degrees of freedom to move about and create bond relationships. Accordingly, it is more difficult to recognize this structure as being a language.

However, those same water molecules can be arranged in a quasicrystalline manner, with organizing rules and hinge variables or limited degrees of freedom within the rules. The hinge variable can be creatively used to code any information into this structure, qualifying it as a language.

NOTE: Regardless of the example we gave above for easy understanding, we suspect even liquid water is a language and that randomness does not exist in nature. In fact, it is known that randomness is a theory with no concrete evidence due to the fact that our measuring equipment does not operate anywhere close to the Planck time or Planck length.

The organizational rules in QCs comes from their relationship to higher dimensional crystals. For example, the Penrose tiling has 8 vertex types and organizational rules derived from how it is projected to the plane from the 5D cubic lattice, Z5(a crystal). All crystals can project to lower dimensional QCs. Before the projection, an operation known as a "cut" is necessary in order to select the layer of the higher dimensional object that is projected to the lower dimension. Our group is interested in 4D QCs derived by cut and projection of the E8 lattice, which is the densest packing of spheres in 8D, often called the most beautiful object in mathematics. The reason for our interest is due to the work of our colleagues Tony Smith [25] and Carlos Perelman [26] as well as associate Garrett Lisi [27]. They showed that gravity, electromagnetism, the nuclear forces and spacetime can be unified using the mathematics of E8.

Phasons are dynamic patterns in QCs called "quasi-particles". They have both wave and particle like characteristics, but their motion comes in discrete quantized jumps of the constituent tiles in the QC. And because phason dynamics follow our three qualifiers of language, any information can be communicated with the wave patterns of phasons. Quantum field theory is one of the most powerful sets of equations describing key aspects of nature. It takes the older idea of smooth waves, which can be any wavelength, and "pixelates" them into little "tiles" of spacetime and "probability space". The equations are powerful, but there is no first principles explanation for why reality is "pixelated", just as there is no first principles explanation for the fine structure constant, gravitational constant, electron rest mass or any fundamental law or constant of nature. Our QC algorithmic language concept offers a potential formalism for using units of consciousness to describe the "jagged" non-smooth wave-like nature of reality.

Readers familiar with the particle-like patterns called cellular automata, such as those in John Conway's *Game of Life [28]* or described in Stephen Wolfram's *A New Kind of Science [29]*, may notice their similarity to QC-phasons . Phason systems can have "hinge variables" within their rules. And so can cellular automata and even fractals, but they generally do not. When these systems have no hinge variable, they are deterministic algorithms and not languages. Nature does not appear to be based on deterministic algorithms. Our group has demonstrated that fractals and cellular automata can be programmed with hinge variables in the algorithm that are acted upon by emergent states of the evolution of the system, creating integrated feedback systems similar to our view on how the QC spacetime algorithm works, where subsystem consciousnesses and the universal consciousness inform and co-create one another's decisions at all scales. Because our concept employs a language with a hinge variable, high order emergent states of the system, such as humans, can direct the system in a reverse cascade of causality all the way down to the Planck scale QC tiles, acting on the hinge variable in the algorithm and engaging with it to form resonant feedback loops.

Our program is focused on modeling spacetime on a 4D QC derived from the E8 lattice. Points of consciousness operating in the E8 hyper-crystal "mother" of the 4D QC can make observations there (see rudimentary examples in 1.6 above) to actualize into informational space a certain set of "tiles" that are symbols in the algorithmic language of "pixelated" spacetime.

For those visually inclined readers, a helpful way to think about this is to view online gif file animations of "Jitterbug transformations" (https://www.youtube.com/watch?v=FfViCWntbDQ), a term coined by Buckminster Fuller to describe a process of rotations of edges on a polyhedron that transform it into a different polyhedron [30]. The reader may then be able to visualize a 3D quasicrystalline tiling of, say, two polyhedral shapes, where at any time, one shape is Jitterbug transforming into the other. When one of the polyhedral shapes in the tiling, say "shape A", transforms into "shape B", a polyhedron with shape "B" in another location must transform into "shape A" so that they all fit together nicely to tile space. And when one of these dynamical 3D tilings of two or more shapes is ordered with certain rules relating to the projection of a higher dimensional lattice, it is a dynamic QC – a phason system. Jitterbug waves from different directions can simultaneously flow through this QC such that, from a distance, the patterns of motion look smooth like fluid dynamic systems in nature. (Please refer to this link for an analogy of the fluid nature of the phasons:
http://mainisusuallyafunction.blogspot.com/2011/10/quasicrystals-as-sums-of-waves-in-plane.html)

2.1 Combining the Jitterbug Wave Idea with Units of Consciousness and Language

Continuing with the above example of Jitterbug waves, consider that each of the two shapes "A" and "B" act as symbols or letters in a language. Their relationships form "words". In QC terminology, we call these words "vertex types". The vertex type "words" join together into larger complexes that are like "sentences", which are called "super-cells". Dynamically, all these objects work together to form wave-particle like patterns in QC-phason systems. Mathematically, the concept can be described with or without geometry. Either way, it is a language because of our 3 defining characteristics of language. As referenced in 1.6, a unit of consciousness can operate on some ideal base structure, which is also equally as abstract as the units of consciousness. First we shall give a simple example using graph theory. Imagine a

block divided into 100 cubes with a unit of consciousness assigned to each vertex. Here, the visualization of the block of cubes is a tool to think about a network of connections made mostly of vertices shared by 6 edges. The idea here of the geometric cube is just a visual tool or mental "graph". In this example, there is no actual spatial geometry. Now imagine there existed a code with a degree of freedom, where the letters A to F or the numbers 1 to 6 are used, each a different quantity of the 6 possible edges meeting at each vertex. The rules for such a code that operates within these 100 points or units of consciousness might allow them to creatively "sparkle" sequences of the 6 letters/numbers of this language to convey a pattern. Now, imagine we are unaware of this code because it occurs very fast. From our perspective, their behavior might appear random because we would not be able to predict outcomes. However, because there is an underlying code, we might notice consistent higher order patterns emerging but only on averages and never predictable with certainty. If this system were a toy universe, we would call these averaged patterns "laws of nature" because they would always be evident over large averages. Over millions of unpredictable choices, we might see a very foundational pattern emerge – the waveform for example. For us, we would describe this as a wave of probabilities since we can only see it after measuring and averaging many of these apparently sporadic decisions. This is exactly how a phason system in an actual metallic quasicrystal works. When several phason particle/waves are propagating through the material, the wave interaction looks smooth. But when we zoom into the micro scale, we notice that the atomic jumps that make these wave patterns must mathematically coordinate within the QC matching rules. Each step in a propagating wave must be calculated with respect to the other phason waves (which are tile flips, i.e., atom position changes). Therefore, the patterns have no option but to jump about. Perfect adherence to a wave pattern could only occur if there were only one phason in the system. But multiple phasons in the same QC have to "take turns" within the allowable syntax and hinge variable rules in order to have each of their tile flip patterns conform as closely as possible to the trajectory of their wave propagation patterns. And so over large numbers, each averages to a near perfect wave pattern even though, at the most granular level of change, tile flips can jump significantly off course from its overall wave pattern.

A second example is the geometric type. Let's continue with our 100 units of consciousness assigned to 100 cubic cells. We had a network of about 100 connected vertices with 6 edge connections each. We expressed that graph theoretically without respect to the idea of cubes or space. The units of consciousness picked integer values between 1 and 6 connections from each of the 6 connections possible each vertex. The idea of a connection network – like a network of friends, has no need for the notion of space.

In this second example, we will interpret this same information to be a cubic tiling in 3-space. The units of consciousness are going to be assigned to "look" at their cubes from one of only two vantage points or possible measurements. This will create 2D projection transformations of the cube. We will call one type of projection "A" and the other "B". If the units of consciousness and cubic cells are adjacent in the 3D structure, we shall say that they must lay down their projections on the plane in an adjacent or connected manner as well. In other words, 100 units of consciousness will take photographs of their cubes from one of only two vantage points to create 2D shapes "A" and "B". And let us further imagine that these two shapes can aperiodically tile the plane if matching rules with allowable degrees of freedom are followed. The units of consciousness in the cubic lattice would have to know what those rules and degrees of freedom

are before making their individual choices. They would also have to know what the others around them are choosing or be part of the same meta-consciousness. If they do these things, they can use the flexibility within the rules to generate a wavelike animation of tilings of the plane where you would notice patterns vibrating through the animation from different directions. The rules and cooperative freedom and finite number of shapes that can be created from the pictures taken by the units of consciousness are a "wave language". So as they unpredictably express their group ideas using this language, we will see extremely reliable tendencies that we can call "constants" or "laws of nature". But at a granular level, we will not be able to predict the letters chosen. The wave language would describe the physical phenomena of nature.

Our program is to use the concept of units of consciousness making choices within a language structure to generate 4D QCs derived from the E8 lattice that model dynamic waves of spacetime with emergent force and mass qualities as "perturbations" within the system. There will be various equivalent ways to explore this overall language, which we will call "dialects" because they will have the same root language but perhaps will look very different mathematically, using different formalisms. For example, our colleague Tony Smith uses the real Clifford algebra Cl(16) on the same base object, the E8 lattice, to unify spacetime and the four forces [25].

2.2 Clues That Nature Is a QC Based Language of Primary Consciousness Units

Golden Ratio in Nature

QCs are described by golden ratio based math [31]. The golden ratio is found in nature at all scales with hundreds of published references [32-35]. For example, the 2010 paper, "Quantum Criticality in an Ising Chain: Experimental Evidence for Emergent E8 Symmetry," reports the discovery of the golden ratio and the related structure of the 8D lattice E8 in the atomic structure of cobalt niobate [36].

Xu and Zhong's paper [37], "Golden Ratio in Quantum Mechanics," points out the connections to the golden ratio in various works – linking it to particle physics and quantum gravity (quantized spacetime). They say (note that QCs are the quintessential example of non-commutative geometry and are fractal):

> *… we would like to draw attention to a general theory dealing with the noncommutativity and the fine structure of spacetime which comes to similar conclusions and sweeping generalizations about the important role which the golden mean must play in quantum and high energy physics… …In a unified picture where all the five forces melt into one it is reasonable to suspect that the golden ratio will play a fundamental role.*
>
> *This fact immediately follows from the work of the French mathematician Alain Connes and the Egyptian engineering scientist and theoretical physicist M.S. El Naschie. In Connes' noncommutative geometry his dimensional function is explicitly dependant on the golden mean. Similarly the bijection formula in the work of El Naschie is identical with this dimensional function and implies the existence of random Cantor sets with golden mean Hausdorff dimension as the building blocks of a spacetime which is a Cantor set-like fractal in infinite dimensional but hierarchal space. Invoking Albert*

> *Einstein's ideas connecting spacetime to geometry with energy and matter, it is clear that these golden mean ratios must appear again in the mass spectrum of elementary particles and other constants of nature.*

Evidence of Higher Dimensional Polytopes and Lattices in Nature

All particles and forces can be transformed into the others via gauge symmetry operations [38]. This tells us something deep about nature and convinces physicists that there is a yet-to-be-discovered first principles theory that will allow us to understand how everything in nature is a manifestation of the same underlying object. The gauge symmetry transformations plot perfectly to the vertices of certain golden ratio related higher dimensional polytopes and lattices related to the E8 lattice. Tony Smith Garrett Lisi and Carlos Perelman are three of many physicists publishing results linking spacetime and particles to the golden ratio related E8 lattice [25-27]. All lattices project to QCs, which non-locally encode information from the higher dimensional object in the lower dimensional projection.

Non-Locality

Nature is known to be inherently non-local [39]. For example, when two particles are entangled after being superimposed into the same space, they will instantly mirror one another's behavior as if connected – no matter what the distance is, even light years apart. QCs are inherently non-local [40]. For example, a change in one part of the QC changes other parts of the QC instantly, regardless of the distance.

Non-Commutative Geometry

Lee Smolin in Three Roads to Quantum Gravity said:

> *…evidence has been accumulating that string theory and loop quantum gravity [a quantized spacetime theory] may describe the same world. One piece of evidence… … is that both theories point to some version of the holographic principle. Another is that the same mathematical ideas [and] structures keep appearing in both sides. One example of this is a structure called non-commutative geometry.*

Many leading physicists and mathematicians, most notably Alain Connes, publish evidence indicating that non-commutative geometry will be at the heart of a new first principles theory of everything [41-43]. Again QCs are the quintessential example of non-commutative geometry [44, 45].

Quantum Fluctuation and Quantum Jumps

There is no first principles explanation for why the energy state change of an electron orbiting an atom causes it to instantly teleport from one orbit to the next without traversing the space in between. Modeling particles with QC math would not only explain this, it would require it. And the same can be said of quantum fluctuations in vacuum space, where a particle appears in one location and then abruptly disappears, while maintaining the same total number of these ghostly

objects. Modeling spacetime with QC math can explain this behavior. A dynamic QC system requires a conservation in the number and ratio of vertex types. When one vertex type disappears in one frozen frame of the dynamical animation, an identical one instantly appears in another location in the next frozen frame of change – a shared characteristic with quantum fluctuation and quantum jumping. Also, quasiparticles in a QC vibrate due to being composed of discrete pixels or tiles, which cannot move smoothly. This is a shared quality with quantum particles, which are known to vibrate – "quantum jitter".

Retro-causality and Special Relativity

Daryl Bem of Cornell published a great deal of research evidence on retro-causality [46, 47], providing robust evidence that events in the future loop back to change events in the past. These experiments were done with human subjects, who were influenced by events that were to occur in the future of the experiment, as generated by a random number generator. The effect did not change over distance or time. In fact, many other published works support the existence of this and similar phenomena. This should not come as a surprise. Post 1905, since we have understood Einstein's special theory of relativity, we have come to grips with the non-intuitive idea that the past, present and future exist together on a geometric object called spacetime. The reason some scientists presume retro-causality should not occur is because relativity theory and experiment indicate that light cannot move backwards in time to communicate information. However, considering the fact that particle entanglement experiments show that particles are non-locally entangled across spacetime, instantly mirroring the actions of one another, it is not necessary to rely on light to connect information non-locally. Big bang theory says that, at one time, all particles occupied the same space. If true, everything is quantum entangled non-locally. Furthermore, there exists no widely accepted unification theory, so there is no theory we can rely on to say that non-light based information cannot be connected non-locally without the need to encode it in light. This idea does not contradict special relativity because the speed of light is not exceeded. Connecting systems of information, as with quantum entanglement and quantum teleportation, is not the transmission of information. It is the connection of two or more systems of information into a single object.

A QC spacetime, based on the E8 to 4D QC, allows for algorithms that create instant relation of information between two or more regions of spacetime (such as human minds). This mechanism predicts that reality would be a system of causal and retro-causal feedback loops, where all things forward in time loop back to influence all things backwards in time – thus changing the events forward in time and so on. This standing wave concept, where events described by the primitive spacetime algorithm vibrate forward and then backwards in time, means that events across spacetime co-create one another. For example, if you have a precognitive intuition of something, it is akin to "remembering" forward in time. But the "memory" of that event changes the structure of your brain patterns in your present, which acts as a "butterfly effect", changing all events in your future and so on – a vibration of bi-directional causality.

Consider Bem's evidence for retro-causality. Would human minds be influenced by future events only during his lab experiments or at all times? There is nothing special about his experimental set up which produces retro-causality. And his data show that retro-causal phenomena do not get stronger or weaker depending on how far one separates the events from

one another in space or time. This evidence invites the conjecture that every event co-creates every other event in both directions of time.

Golden Ratio as the Ultimate Self-referential Number

Ultimately, a consciousness based universe mathematically observing itself into existence from countless Planck scale vantage points is a self-referential universe. In one sense, consciousness is a "recursive sense of changing self" – a rapid sequence of observations between your sense of self in one moment and your new sense of self that you observe in the next moment. Each event of updated self-observation changes you – thus requiring another observation to know your new self. It is the dynamism of this process that generates a stream of self-awareness – consciousness.

In Section 1, we discussed how consciousness and measurement are ultimately the same thing. To be conscious is to continually observe. And observations are relationships that always include the observer as one of the relators. For example, an observer can observe two things. This creates a triangular relationship, where each of the two individual things is related to the observer and to one another according to how the observer sees the two things relate to one another. A simple example would be your observation of two cubes sitting on the table. You are measuring their orientation to one another, but you are also making a perspective transformation of each, where you flatten them into 2D pictures according to your relationship to them, your vantage point. The "real" cubes in 3D all have the same length of connection (edges) between the 8 vertex points. But your observation/measurement, via perspective transformation to 2D, rearranges the distance ratios of the 8 points of each cube in the 2D picture in your mind from being 1:1:1:1:1:1:1:1 to some other set of values. All physical measurements, are composed of distance ratio relationships between the sensor (observer), such as an eye, and individual points. For example, when your eye looks at an apple, you are actually measuring an enormous set of distance ratios (relationships) between points on the skin of the apple and your eye, as plotted onto a 2D construct in your mind. All measurement is ultimately a pattern of ratio changes of points in the "measurement", i.e., the informational model generated by the observing device or being – a measurement which is composited of relationships between the observer and the points in spacetime that describe the object being observed.

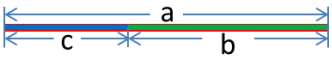
Measurement, consciousness and the notion of ratio are deeply related. But how would this fact connect to the concept of a finite character set and relational rules and degrees of freedom at the Planck scale fabric of reality – the algorithmic language generated entirely by measurements of units of consciousness on base objects? A beautiful equation or efficient computer algorithm describes as much information as possible with as little resources as necessary. This makes sense if you want to conserve ink and paper in your equation writing or conserve computer resources. Our postulate is that reality is pixelated events (observations) of consciousness related according to an algorithmic language. But why would the universe want to conserve consciousness in as efficient a manner as possible? What is the helpfulness of an efficient algorithmic language of spacetime/reality? Freeing up consciousness units to create more self-reference allows nature to do more with less. Consciousness in this most general sense tends towards creating as much experience as possible, thereby expanding the size of the set of all events – of all of "creation". We certainly see this energetically conservative or efficient

behavior in nature from thermodynamics to the behavior of biological systems as the set of all events of the universe expands.

The E8 based algorithmic language we've been speaking of is an algorithm of ratios, which can be expressed in graph theoretic, topological, Euclidean geometric or other formalisms. We pose the question: What is the most efficient ratio possible?

To answer that question, we need to define "efficient". Efficient, for our purposes of a spacetime code is to create maximal information with minimal symbolism or ratios. This equates to minimal measurements/observations/operations. And what is "information" in this context? It is relationships generated by measurement or comparison, particularly rations created by division. So, then, what division is the most efficient?

Divisions



For the Φ (golden ratio) division, there is only one ratio needed for encoding the relationships of the consecutive segments going down in the length

$$\frac{a}{b} = \frac{b}{c} = \varphi,$$

or going up in the length

$$\frac{c}{b} = \frac{b}{a} = \frac{1}{\varphi}.$$

For example, any other division, such as dividing into thirds, requires two ratios and therefore more symbolic information to express:

$$\frac{a}{b} = \frac{3}{2}, \frac{b}{c} = \frac{2}{1} \text{ or } \frac{c}{b} = \frac{1}{2}, \frac{b}{a} = \frac{2}{3}.$$

For golden ratio divisions: going down from long to short, the ratios between adjacent pair is the golden ratio; going up, it is the inverse of the golden ratio. For divisions other than the golden ratio, going down needs two ratios (3/2, 2/1 for example); going up also requires two ratios. If primitive units of consciousness operating in the spacetime algorithm use observation based operations to generate informationally compact symbolic objects that are themselves ratios, and if there is a benefit to efficiency, the golden ratio is the most efficient operator possible.

The other aspect of the golden ratio that is unique and may be important for the algorithm is its fractal nature. In the last 35 years, fractal mathematics has been found to be at play at all scales of the universe from the cosmic to the sub-atomic [48-50].

Dividing a line by the golden ratio: If we take the short length and place it on top of the long length, we are left with a section of the long length that is left over. That length is even shorter than the short length of the first division. And the ratio of this new short length to the original short length is the golden ratio. And this process can continue to infinity in the small direction with the ratio of the remainder to the previous length always being the golden ratio. Furthermore, this process can be applied in the other direction, where we add the long piece from the original division to the undivided length. The ratio of the new combined length to the long length from the first division is the golden ratio. This also continues to infinity. The golden ratio is the ultimate recursive fractal, generating the most information for the least amount of symbolic and operational action.

The E8 based quasicrystals that we work with are constructed from the golden ratio in a fractal manner [46].

Quantized Rotation and Waveform

Particles rotate in a very different way than how rotation occurs with large objects. For example, their rotation occurs in discrete instant jumps from one position to the next. In addition, their spin consists of two spherical scalar waves, one inward and one outward. Our group models the electron as a composite of 57 tetrahedral tiles (within a QC packing of tetrahedra), corresponding to how 57 tetrahedra relate in the 4D object known as the 600-cell (a 4D "icosahedron"). In most close packed 3D configurations, however, this 57-group is less symmetric than in the maximally dense configuration possible in 4D. When a second frozen frame of change (time) occurs, the most asymmetric part of the 57-group abruptly jumps to another portion, according to the ordering rules allowed in the QC language. We foresee an emergent dynamical pattern, where two opposing closed waveforms of this pixelated pattern of change flow through the 57-group as the entire object propagates, spherically rotating. While this aspect of our work is still in its infancy, the concept itself agrees with many of the previously unexplainable mysteries of quantized electron spin.

Fractal Structure

Many interesting scientific papers have been published of mathematical models of spacetime as a fractal structure [52]. And fractal structure has been reported in many natural systems, including brain structure and cosmic scale formations [53-57]. QCs are fractal.

Consciousness Is Proven to Interact with Reality in the Double Slit Experiment

The unexpected relationship of consciousness to physical reality, as demonstrated in the double slit experiment, the seminal experiment of quantum theory, has been written about extensively [58]. As Frank Wilczek stated, we must figure out how to use consciousness operators at the quantum scale if we are to move forward towards a powerful theory of everything. It is now approaching 100 years since we were confronted with the shocking truths of quantum mechanics. It is time we take bold steps by using consciousness operators to build a mathematical view of reality that accepts consciousness as being primary, using primitive Planck scale operations of

consciousness/observation. QC math allows that approach to be adopted within the formalism of a mathematical language that shows a correspondence to physical reality.

Holographic Principle

In 1993, Gerard t'Hooft proposed what is now known as the holographic principle [59], which states that the information contained within a region of space can be determined by the information at the surface that contains it. In other words, it is counterintuitively based on the square and not the cube of the radius. Later, Juan Maldecena developed a certain mathematical "proof" making t'Hooft's principle very attractive to many physicists [60], leading to numerous conjectures that a future predictive theory of everything will relate to the holographic principle [61, 62].

Our group published two papers on a law we discovered called the Sum of Squares law [63, 64], which shows how the information of any projection of a regular or semi-regular polytope (and by extension, related lattices/tilings) is conserved as different ratios of transformed edge lengths of a value which is the sum of the squares the transforms, a value which relates directly to the dimensions involved in the transformation. While it is not clear if our law relates to the holographic principle, we can relate it to QCs and, by extension, suggest that QCs could relate to aspects of the holographic principle. In the holographic principle, the information of an object in one dimension contains the information of an analogue object in another dimension. The information of, say, a tetrahedron is contained in a projection of the tetrahedron if one uses the principles implied by the Sum of Squares law to decode the projection. QCs are projections (with layer selections) of tilings of polytopes, so QCs encode the information of their higher dimensional pre-images (in the case of our QC's, the E8 lattice). So the relationship to squaring and the transdimensional encoding of information between different dimensions is a feature both QC math and the holographic principle have in common.

2.3 Quasicrystalline String Theory

Our ideas are similar to string theories in terms of vibrating string resonance modes. String theories are generally background dependent, which means that theorists drop the concept of strings into a smooth spacetime background without giving a first principles explanation of what spacetime is at the quantum scale. Quantized spacetime theories are called "quantum gravity" theories and are therefore background independent [58] because they describe spacetime as quantized and don't depend on it being artificially added to the theoretical model. Most string theory scientists agree this lack of background independence is a significant shortfall of string theory and agree that a background independent version of string theory must be developed (some have been but none are well received).

Our framework, which can be thought of as a quasicrystalline string theory, is background independent. And we expect string modes of vibration to correspond to observed particle data.

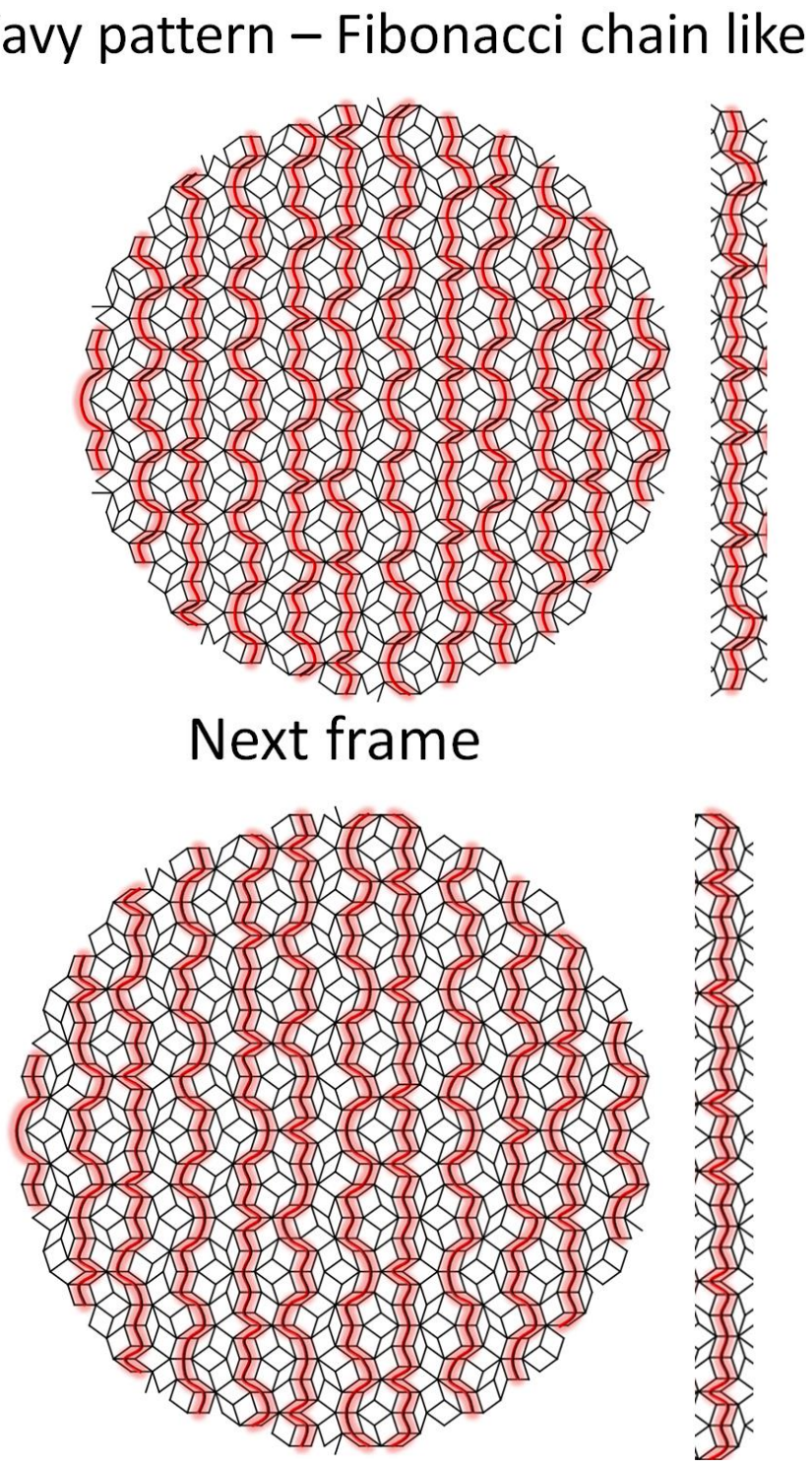
In his paper [65], "Fractal Strings as the Basis of Cantorian-Fractal Spacetime and the Fine Structure Constant," Carlos Castro Perelman discusses interesting ideas relating the golden ratio to quantum spacetime and strings. He discusses the relationship to QCs, saying:

> *Beginning with the most general fractal strings/sprays construction recently expounded in [on] the book by Lapidus and Frankenhuysen, it is shown how the complexified extension of El Naschie's Cantorian-Fractal spacetime model belongs to a very special class of families of fractal strings/sprays whose scaling ratios are given by suitable pinary (pinary, p prime) powers of the Golden Mean. We then proceed to show why the logarithmic periodicity laws in Nature are direct physical consequences of the complex dimensions associated with these fractal strings/sprays. We proceed with a discussion on quasi-crystals with p-adic internal symmetries, von Neumann's Continuous Geometry, the role of wild topology in fractal strings/sprays, the Banach-Tarski paradox, tesselations of the hyperbolic plane, quark confinement and the Mersenne-prime hierarchy of bit-string physics in determining the fundamental physical constants in Nature.*

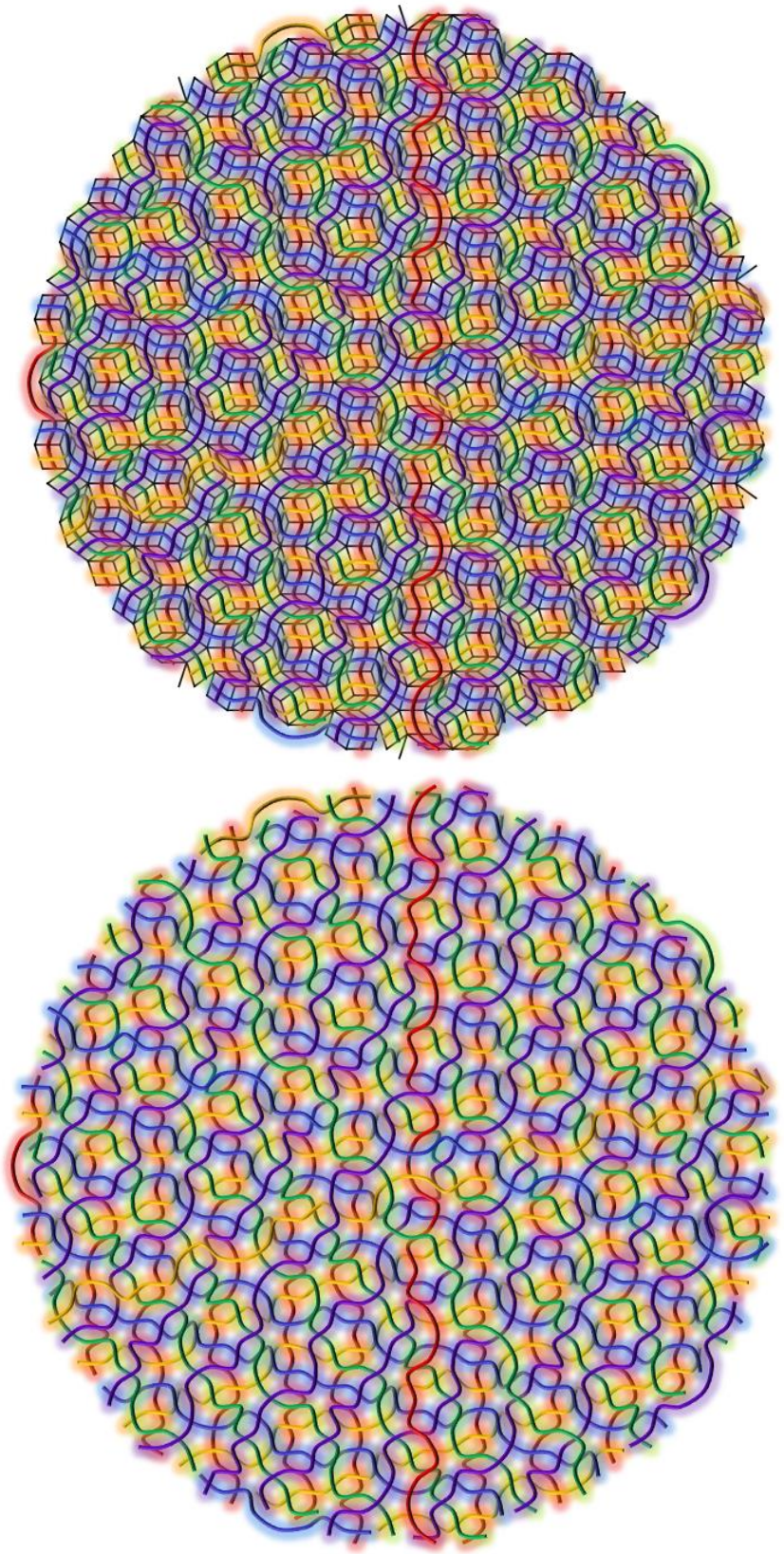
Our work contemplates the idea of "quantized strings", which are strings that are jagged (non-smooth). To develop a visual intuition for how strings would operate in a quasicrystalline language, let us first understand what "string" means in this context. A string is a 1D vibrating pattern. 1D strings vibrate in all dynamical QCs, regardless of the dimension. In fact, the string itself, even if in a 3D QC, is itself a 1D QC. All QCs of higher dimension are composites of QCs of lower dimension. For example, our 4D QC derived from the E8 lattice is a crisscrossing network of 1D QCs living in different 1D spaces within the higher dimensional object.

We will use the 2D QC known as the Penrose tiling in our examples to explain how vibrating quantized strings composite to higher dimensional wave systems in QCs. This wavy pattern is a Fibonacci (golden ratio) chain-like code in the Penrose tiling QC, which is derived by projecting the 5D cubic lattice to 2D. Notice that it is a "pixelated" or quantized wave because, up close, it is jagged and unsmooth. Note that the Fibonacci sequence chain can be thought of as the quantized or "pixilated" analogue of the "smooth" golden ratio. Like pi, the irrational golden ratio has an infinite number of digits. The ratio of each successive two integer numbers of the Fibonacci sequence oscillate above and below the golden ratio, getting closer with each successive ratio until converging with it at infinity, becoming the golden ratio. The Fibonacci sequence is the "pixelated" or quantized version of the golden ratio.

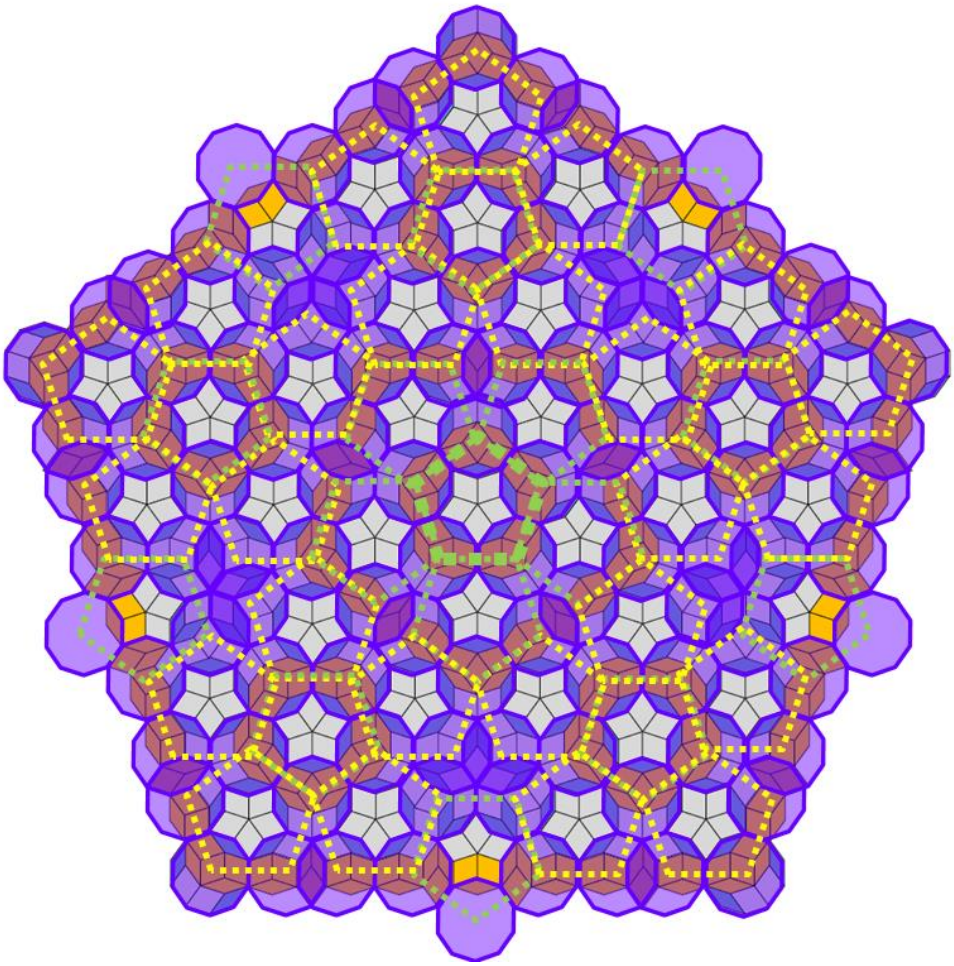
Below, are two frozen frames of time in a phason quasiparticle pattern within a small section of the Penrose tiling QC. The relationship between the two frames animates into a brief moment of a vibrating string pattern. The second frame is composed of tile flips, where the first wave pattern is inverted. Over many frames, a physically realistic golden ratio based vibrational dynamic results. The number of the thin and fat tiles, as the string gets longer and longer, form a Fibonacci sequence.

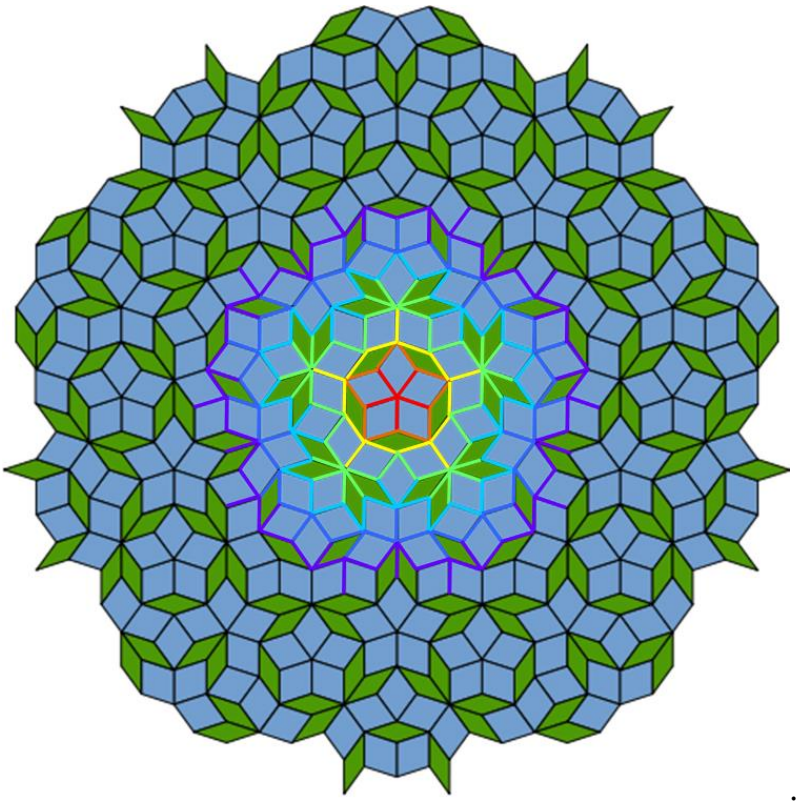


Single strings combine and form knot-like structures with other stings.

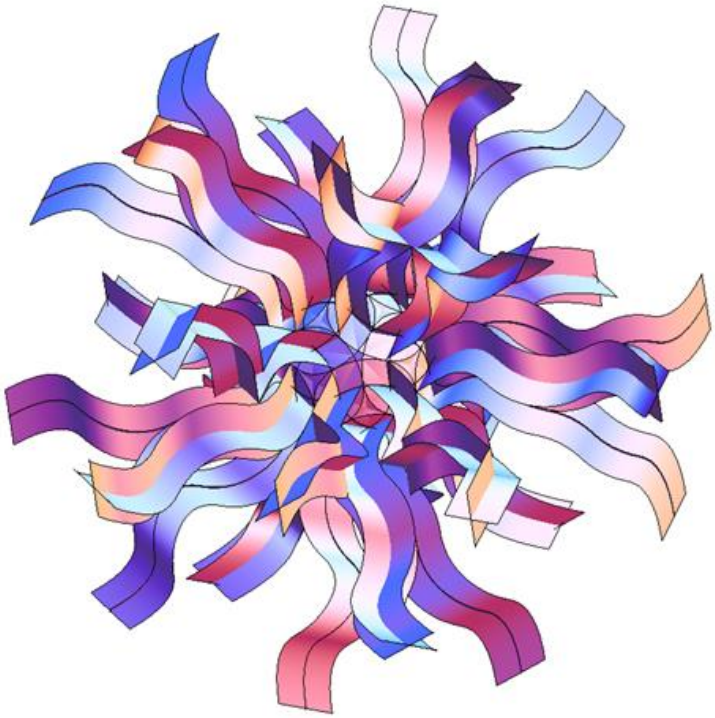


Since QCs are discrete (pixelated or quantized), the vibrations of its strings are also discrete (only certain values are allowed). But these values scale in the same way because QCs are fractal. Let us call the primary vibration mode the golden ratio, since the smallest scale of the spacetime QC (the primary tile scale) is golden ratio based. A QC scales up, in a fractal manner, with integer values of additional tiles combined with the golden ratio value of the base tiles. This results in scaling ratios based on integer multiples of a golden ratio value, very similar to the prime number multiples of the golden ratio mentioned above in the quote from the Carlos Perelman paper.



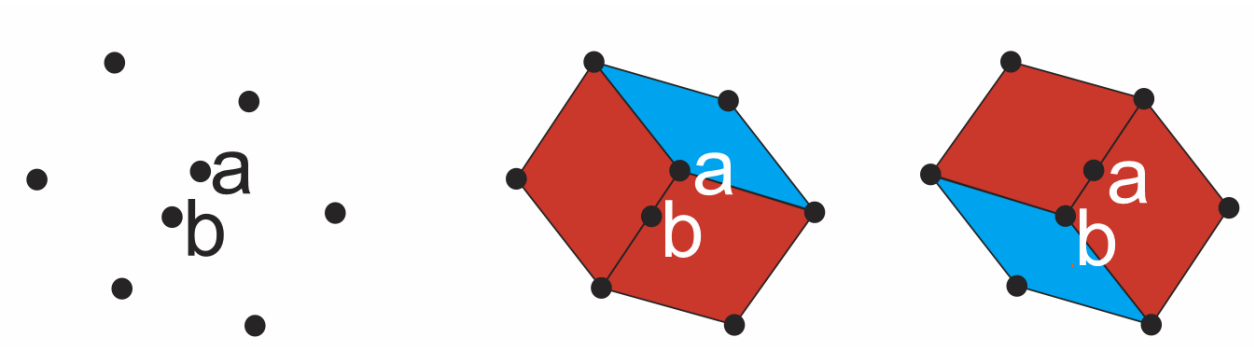


1D "pixelated" QC strings combine, building up to 2D QCs, 3D Qc, 4D QCs and so on.



We have spoken above of "letters" and "words" in an algorithmic language driven by coordinated choices of primitive units of consciousness at the Planck scale. Within the idea of letters in this code, there is a simpler object that makes up the letters that we can call a "letter stroke". These are binary objects very much like the idea of "qubits". A quasicrystal is a set of points. But the connection network between the points determines the orientation of the "letters" or tiles. And again, it is the group patterns of these orientations or "tile flips" which creates the phasons – the vibrating strings. A single connection between points can be thought of as a "letter stroke".

For example, the eight points on the left are part of the point set derived by projecting the 5D cube to 2D. This is an example of a "base object" that can exist in conscious information space. If we use our consciousness to recognize point "a" as being "on" and "b" as "off", then our tiling section looks like the middle image. And if we recognize it the other way around, the tiling pattern flips and we actualize into conscious space the section shown on the right. Either the group of tiles is in the "up" position or the "down" position. In this way, we use binary choices of recognizing a point as being either "on" or "off" to modulate the connection network and create phason wave patterns in the QC. When applying the notion of consciousness to this binary view, we can have three states: "on", "off" and "either on/off". That last value seems paradoxical but is a well-developed area of formal logic and used in quantum theories.
The image on the left shows points "a" and "b" as being either both "on" or both "off". The idea is that until you "observe" or decide whether each is "on" or "off", they are in a floating or undecided state.



2.4 Conclusion

The so called hard problem of consciousness may be hard because it is a false question. If even photons cannot exist without measuring conscious operators, the ancients may have been correct to say that consciousness is the ground of all being. In that case, trying to build up to consciousness with macro-scale biological theories may not work. Everything would be consciousness – just very different degrees of consciousness.

The discussion of our quasicrystal approach aside, we have offered a logical deductive approach to the hard problem and suggested that it must be explored through the deeper questions of the philosophy of fundamental physics – basic ontology. Stephen Hawking posed two questions that get to the heart of this ontological problem:

Why does the universe go to all the bother of existing?
What is it that breathes fire into the equations and makes a universe for them to describe?

The answer is self-referential consciousness, beginning at the core of reality – at the smallest scale possible. We suggest that consciousness is in everything and is everything. And collective networks of quantized consciousness, such as animal brains, have emergent states of high-order consciousness because the universe as a whole (and all subparts going down to the Planck scale) is conscious by necessity when one understands that reality is information theoretic. This takes the motivation out of the attempt to explain the subjective sense of human consciousness by biological means alone – subjective consciousness is the key foundational aspect of reality itself. But we admit to the reader that one even larger problem is left in place of the hard problem of human consciousness:

What is it that causes the Planck scale primitive units of consciousness to exist, allowing them to build up to human minds and other collectives such as the supposed collective consciousness of the universe? What came first, the collective consciousness or the primitive units of consciousness – the chicken or the egg?

We suggest that this is another false question. One must bend the linear causal chain implied in the question into a circle. Instead of thinking in a bottom-up reductionist and linear manner or a top-down way, where a sort of "god consciousness" exists outside the influence of the rest of the universe, we should be bold and consider the counter-intuitive lessons of special relativity combined with our thesis that the future loops back in all cases to influence the past. The whole system across spacetime is just that – a single interactive system between past and future, where the older notions of unidirectional cause and effect are updated.

We humans are capable of acting as a larger "mind" than the cells of our body – the more primitive living entities that compose us but yet have primitive consciousness that some agree living things possess. A nation of humans can focus on going to Mars. The higher order connections of the Internet can be thought of as changing 7 billion humans into a sort of neural network, where memes flow through our population like the thoughts of a mind. Our science is accelerated through this new hyper-connectivity – as though a fire has been fueled with the kerosene of high-connectivity. A beautiful principle of systems theory is that emergent states loop back to inform foundational states, which in turn change the emergent states and so on – a feedback system where all scales of an emergent hierarchy co-create the evolution of the whole.

Bending the above "chicken or egg" question into a circle means that the primitive units of consciousness acting as observing operators in our proposed spacetime algorithmic language exist as vantage points of the emergent whole – the mind of the universe. They exist because the emergent whole exists. The points of consciousness are essentially thoughts within the collective mind of the whole.

And the emergent whole exists because of the emergent behavior of the primitive units of consciousness. The universe is self-observing itself into existence from countless points of

reference via a language with mathematical qualities similar to music. It is evolving itself by being quantized into points of consciousness and other sub-minds, such as us.

The whole exists only because of the parts and the parts exist only because of the whole. Linear causality is an illusion, just as it is an illusion that the past no longer exists and the future doesn't exist yet is. However, illusions tend to persist and lead to false questions.

The informational universe was not created. It always existed within possibility space. And consciousness emerged from this space of possibilities, paradoxically, through non-linear cyclical time – turning out to also be the host of the possibilities. Or put more simply: Because the informational conscious universe is possible, it is – and it self-evolves.

We leave the reader with this bit of prose as an allegory to our scientific view:

> *A dreamer had a dream of many tiny thoughts – all intertwined across what seemed like time and space.*
> *The tiny thoughts were perspectives of the dreamer – all connected in a mathy way.*
> *Some networks grouped into you and I.*
>
> *You might wonder if we're free. That depends on whether the dreamer is free.*
> *You might wonder if we're conscious. That depends on whether the dreamer is conscious.*
>
> *You see, the dreamer is the dream. It is itself the emergent quality of its tiny quantum-physical thoughts. And so are you and me.*

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