The Emergence of Quaternary-Based Computational-Strata from a Symmetrical Multi-Layered Model of Light

Dr Pravir Malik

Deep Order Technologies, USA.

pravir.malik@deepordertechnologies.com

Abstract - **This paper suggests that a symmetrical multi-layered model of light is the generator of increasingly complex computational-strata. The light-based symmetry being quaternary-based, is envisioned to generate similar quaternary-based strata such as the electromagnetic field, quantum particles, atoms, and cells. But such generation occurs through the device of quanta, which is seen to be a bridge mechanism between layers of light. Such strata, afforded stability because the implicit fourfoldness in light seeks integrality even when projected explicitly, allows subsequent phenomenon such as memory and the implementation of universal functionality to arise. Because memory and universal functionality can be implemented in any of the quaternary-based emergent strata through the creation of logical gates leveraging strata-specific mechanisms, such strata become computational-strata. A different object of computation, an innate creativity, becomes apparent when one considers the vast array of unique functionality that is emergent in any layer of computational-strata. Further, the generation of such computational-strata has profound implications on quantum computation, genetics, artificial intelligence, and transhumanism.**

Keywords - quaternary-based computation, computational-strata, electromagnetic field, quantum veil, quantum particles, periodic table, atoms, molecular plans, cells, space, time, energy, gravity, computational devices

I. INTRODUCTION

Computronium, a material hypothesized by Norman Margolus and Tommaso Toffoli of the Massachusetts Institute of Technology is envisioned to be "programmable matter", a substrate for computer modeling (Amato, 1991). Two requirements for computronium are that it allow operation of memory, and universal building blocks that allow implementation of any function.

This paper will make the claim that programmable strata such as computronium, can in fact be generated by a quaternary-based symmetrical multi-layered model of light. Emergences from this model of light, such as the electromagnetic field, quantum particles, atoms, and cells, will in fact be seen as quaternary-based computational medium capable of allowing memory and implementation of function.

The structure of the rest of the paper is as follows:

- Section II will elaborate a model of Light that is proposed to be a generator of computational-strata at different levels of existence.

- Section III will elaborate computational-stratum at the level of the electromagnetic spectrum.

- Section IV will elaborate computational-stratum at the level of quantum particles.

- Section V will elaborate computational-stratum at the level of atoms.

- Section VI will elaborate computational-stratum at the level of cells.

- Section VII will offer a summary and conclusion.

II. LIGHT AS A GENERATOR OF COMPUTATIONAL-STRATA

Light has a significant impact on the experienced nature of reality. Fundamentals such as space, time, and the possibilities of the movement of objects are all tied to the reality of light traveling at speed c, 186,000 miles per second in a vacuum (Einstein 1995). By extrapolating on the necessity for light to move at a constant speed of c it is possible to construct a multi-layered light-based model (Malik 2018a, b; 2020a, b; Malik et al 2019) which can provide significant insight into the nature of quanta, the possibilities of quantum computation, and the generation of computational-stratum at different levels of existence.

An essential model of quanta and quantum computation was suggested in 'Light-Based Interpretation of Quanta and its Implications on Quantum-Computing' (Malik, 2020a). In this model the infinite information conceived were light to travel infinitely fast depicted by the row c_∞: $[Pr, Po, K, H]$ in Equation 1, Multi-Layered Light-Based Quantum-Computational Model, below, precipitates into material reality, c_U - where light travels at speed c, via intermediate realities where light is envisioned to exist at speeds slower than infinity, but faster than c. These intermediate realities are specified by rows c_K and c_N respectively, such that $c_U < c_N < c_K < c_\infty$.

Note that Einstein's Theory of Relativity does not disallow speeds of light greater than c: it is the acceleration to speed c from a slower speed that is not possible (Perkowitz, 2011). Further, spaces with light speeds greater than c should be viewed as property spaces being separate from but influencing physical space as explored by Nobel Physicist Frank Wilczek (Wilczek, 2016).

Referring to the matrix-equation that follows, precipitation itself takes place via a series of quantization functions. The first quantization ($\downarrow$) is specified by ($\downarrow R_{C_K} = f(R_{C_\infty})$) and suggests that reality (R) at c_K, R_{C_K}, is a function (f) of reality at c_∞, R_{C_∞}.

The states of all-presence (Pr) formed because light is instantaneously present in whatever volume is being considered, all-power (Po) formed by the ability of light to overpower any other emergence, all-knowledge (K) formed by the fabric of light being able to record any appearance or disappearance of event, and all-harmony (H) formed by everything being connected in the nature of the all-present light, are mathematically transformed into large sets as specified by c_K: $[S_{Pr}, S_{Po}, S_K, S_H]$, where S_{Pr} is the set of all-presence, S_{Po} is the set of all-power, S_K is the set of all-knowledge, and S_H is the set of all-harmony, respectively.

A further quantization takes place via ($\downarrow R_{C_N} = f(R_{C_K})$), and suggests that reality (R) at c_N, R_{C_N}, is a function (f) of reality at c_K, R_{C_K}.

Hence, elements from each of the four sets combine in unique combinations, specified by c_N: $f(S_{Pr} \, x \, S_{Po} \, x \, S_K \, x \, S_H)$, to create a bases for a practically infinite number of unique seeds.

A final quantization, specified by ($\downarrow R_{C_U} = f(R_{C_N})$), suggests that reality (R) at c_U, R_{C_U}, is a function (f) of reality at c_N, R_{C_N}. This quantization results in material reality, specified by c_U: $[S, T, E, G]$, where S refers to Space, T refers to Time, E refers to Energy, and G refers to Gravity. Space – which can be envisioned to be the arena for all the subtle-seeds leading to the creation of material possibility. Time – ensuring that the possibilities in the seeds are worked out. Energy – associated with seeds and their conversion into matter. Gravity – specifying relationships between seed and seed and seeds and seeds. Further, Space, being a repository of archetypes represents light's property of knowledge; Time, assuring maturity regardless of opposition represents light's property of power; Energy, allowing seeds to have presence, represents light's property of presence; and Gravity, allowing relationship between seed and seed, represents light's property of harmony.

Hence the multi-layered light-based quantum-computational model is summarized as:

$$\begin{bmatrix} c_\infty: [Pr, Po, K, H] \\ (\downarrow R_{C_K} = f(R_{C_\infty})) \\ c_K: [S_{Pr}, S_{Po}, S_K, S_H] \\ (\downarrow R_{C_N} = f(R_{C_K})) \\ c_N: f(S_{Pr} \, x \, S_{Po} \, x \, S_K \, x \, S_H) \\ (\downarrow R_{C_U} = f(R_{C_N})) \\ c_U: [S, T, E, G] \end{bmatrix}_{Light}$$

Eq. 1: Multi-Layered Light-Based Quantum-Computational Model

Note that because space-time-energy-gravity appears to come into existence when light precipitates to speed c, it is fair to assume that the deeper nature and activity at the quantum veil before matter is formed, is of the substance of space-time-energy-gravity. As proposed in The Origins and Possibilities of Genetics (Malik, 2019), space-time-energy-gravity can also be thought of as the script used to write a "law" about any specific emergence, which get aggregated into the overall dynamics of Space, Time, Energy, and Gravity as experienced at the macro level.

This quantum-computational model, as will be illustrated in the following sections, can be thought of as a generator of quaternary-based computational-strata, ranging from the electromagnetic field to any living cell.

III. ELECTROMAGNETIC FIELD BASED COMPUTATIONAL-STRATUM

At the electromagnetic field level, the four properties of light are expressed by the range of wavelengths implicit in the electromagnetic spectrum (knowledge), its implicit energy-gradient (power), the speed c with which it is propagated (harmony), and the potential for mass (presence) also implicit in it, respectively. This four-ness is a prerequisite for the strata to be sustainable because it is only when what is implicit and integrated in light becomes explicit and maintains that integrality that strata-stability can be created.

Specifically, from the range of different types of waves from radio waves to gamma rays, determined as a function of frequency and wavelength of light, the electromagnetic spectrum itself is a repository of knowledge of a vast range of phenomena experienced in the Universe as indicated by Equation 2, Knowledge-Wavelength Relationship:

$$Knowledge \propto [f(\lambda)]$$
Eq.2: Knowledge-Wavelength Relationship

But further, there is a large variance in the frequency of light in the electromagnetic spectrum, and this provides for a large variation in energy or power implicit in the electromagnetic spectrum where v is the frequency of the electromagnetic wave, as indicated by Equation 3, Power-Frequency Relationship:

$$Power \propto hv$$
Eq. 3: Power-Frequency Relationship

As already suggested the principle of harmony is related to the speed of light at U, C_U, as indicated by Equation 4, Harmony-Speed Relationship:

$$Harmony \propto C_U$$
Eq. 4: Harmony-Speed Relationship

Finally, mass-potential can be expressed in the following way since, $E = mc^2$ or $m = \frac{E}{c^2}$, and substituting hv for E, as indicated by Equation 5, Presence-Mass Relationship:

$$Presence \propto {hv}/{c^2}$$
Eq. 5: Presence-Mass Relationship

Any computational-stratum however will need to display the ability to house memory, and further, the capability to arbitrate functionality so that computational tasks can be performed.

Such ability to house memory is clear from the arising of many potential stable states manifest as different frequencies or wavelengths of light, that can also be changed from one stable state to another.

Further, constructive and destructive interference of waves can be leveraged to create the basis of logical gates, conceptually allowing calculations and logic to be implemented.

But further, from the $C_{N:} f(S_{Pr} \; x \; S_{Po} \; x \; S_K \; x \; S_H)$ segment in the preceding quantum-computational model it also becomes apparent how unique seeds or functional states can be created leveraging the four aspects of knowledge, presence, power, and harmony, that architect the electromagnetic field. An equation for such seeds that fulfills the highlighted segment can be adapted from a previous version of the seed-equation (Malik et al, 2015), as indicated by Equation 6, Seed-Aspects Elaboration:

$$Seed = Xa + \overline{Yb_{0-n}} \; where \begin{bmatrix} X \in [S_{Pr}, S_{Po}, S_K, S_H] \\ Y \in [S_{Pr}, S_{Po}, S_K, S_H] \\ a, b \; are \; integers; a > b \end{bmatrix}$$
Eq. 6: Seed-Aspects Elaboration

This equation combines elements from each of the sets of the essential characteristics of light to conceivably spawn an infinite set of seeds. $\overline{Yb_{0-n}}$ implies that the Y- or secondary-element may be repeated multiple times. Notably, such an equation highlights the fact that some of the infinite information that exists within light surfaces in a concrete way at the electromagnetic stratum level, thereby also providing insight into the creative aspect of computation that is integral to the light-based quantum-computational model.

IV. QUANTUM PARTICLE BASED COMPUTATIONAL-STRATUM

This section considers the formation of fourfold stability at the quantum particle level that is generated by further iterations of the light-based quantum computational model. It also suggests how memory and implementation of universal functionality occur, thus conferring computational-stratum status on the quantum-particle layer.

In the fourfold model, quarks are envisioned to be a precipitation of the Light's characteristic of knowledge.

Quarks are the only fundamental particle contributing to creating the nucleus of an atom. Protons, which determine atomic number, are composed of two "up" quarks and one "down" quark. Atomic number in turn uniquely identifies the element from the periodic table. Hence, an atomic number of 47, for example, specifies that the element is Silver. In other words, it can be suggested that the unique properties of an element, the knowledge of what it is and how it will behave in the universe, is related to the quark, as suggested by Equation 7, Knowledge-Quarks Relationship:

$$Knowledge \propto f(quarks)$$
Eq. 7: Knowledge-Quarks Relationship

Electrons can be considered as a precipitation of the characteristic of energy. If the apparent characteristics of leptons are considered they appear to be point-like particles without internal structure (Olive, 2014). While quarks only exist in composite particles with other quarks, leptons are solitary particles. The best-known lepton is the electron. In his book, Representing Electrons: A Biographical Approach to Theoretical Entities, Arabatzis (Arabatzis, 2006) details the characteristics of electrons. The electron may be considered as a surrogate for the lepton class. The electron appears to be the associated with the flow of energy and power. Further they appear to be the adventurers easily leaving the atom they are a part of. They also lock or form bonds with other atoms through the force of attraction and repulsion. This is summarized by Equation 8, Energy-Leptons Relationship:

$$Power|Energy \propto f(leptons)$$
Eq. 8: Energy-Leptons Relationship

The Bosons are thought of as force-carriers. They are what allow all known matter particles to interact. The three fundamental bosons in this category are the photon, the W and Z bosons, and the gluon. The carrier particle of the electromagnetic force is the photon. The carrier particle of the strong nuclear force that holds quarks together is the gluon. The carrier particle for the weak interactions, responsible for the decay of massive quarks and leptons into lighter quarks and leptons, are the W and Z bosons. Bosons can be thought of as the precipitation of what created relationship and harmony at the quantum level. Hence, they can be thought of as the precipitation of harmony as summarized by Equation 9, Harmony-Bosons Relationship:

$$Harmony \propto f(bosons)$$
Eq. 9: Harmony-Bosons Relationship

This leaves the other discovered fundamental particle the Higgs-Boson. In ordinary matter, most of the mass is contained in atoms, and the majority of the mass of an atom resides in the nucleus, made of protons and neutrons. Protons and neutrons are each made of three quarks. It is the quarks

that get their mass by interacting with the Higgs field (Olive, 2014). Hence the Higgs-Boson can be thought of as the mass-giver. In other words, it is what gives presence to the quarks and it can be thought of as the precipitation of presence as summarized by Equation 10, Presence-Higgs_boson Relationship:

$$Presence \propto f(Higgs\_boson)$$
Eq. 10: Presence-Higgs_boson Relationship

Just as there are multiple particles in each of the other 'families' it is likely that there will be multiple particles in the Higgs-Boson family. Recent research at CERN indicates that the Higgs-Boson may have a cousin (Overbye, 2015).

This quaternary manifestation of Light's fourfold properties affords stability to the quantum particle layer suggesting that it is computational-stratum, and that it will allow the operation of memory and the implementation of universal functionality.

A way in which memory may operate is through the action of electrons in an atom. Imagine an electron in a particular orbit around an atom as representing one memory state, and its existence in another orbit as representing another memory state.

Further, gates of various kinds, the basis of implementing digital-paradigm computing power, can be constructed through combinations of orbits in atoms, and the action of photons to flip status of gates, to begin to implement broader functionality.

Finally, stratum specific seeds housing unique functionality are envisioned to exist through the seed formulation introduced in the last section, of which an example is illustrated in Equation 11, Seeds-Leptons Elaboration, for the seed for the family of Leptons:

$$Seed_{Leptons}$$
$$= Xa + \overline{Yb_{0-n}} \ \ where \begin{bmatrix} X \in [S_{Po}] \\ Y \in [S_{Pr}, S_{Po}, S_K, S_H] \\ a, b \ are \ integers; a > b \end{bmatrix}$$
Eq. 11: Seeds-Leptons Elaboration

The importance of stratum-specific seeds cannot be overstated. This, as I have argued in Emperor's Quantum Computer (Malik, 2018b), is part of a quantum-computational process that is inherently creative, as opposed to being just constructive. Constructive computation, where computing is used to regurgitate instruction to copy or construct something as per specific program, is different than creative computation, in which the stuff of matter, life, and mind, as examples, is made to emerge from the information behind the quantum veil, where Light precipitates to speed c (Malik, 2020).

V. ATOM-BASED COMPUTATIONAL-STRATUM

Subsequent to the quantum particle computational-stratum, the next quaternary-based computational stratum to emerge is that of atoms in the Periodic Table. All atoms in the Periodic Table can be classified by p-group, d-group, d-group, and f-group.

The p-group of elements are those with a valence shell specified by the p-orbital, indicating that the probability of the existence of an electron is equally likely on either side of the nucleus. There are some very significant elements in this group that are part of the metal, metalloid, non-metal, halogen, and noble gas sub-groupings. Carbon, Nitrogen, Oxygen, and Silicon are some of the sample elements. In some sense this grouping summarizes all the element possibilities within it. It is perhaps that the possibility of ideas behind all elements has precipitated in this group and one can hypothesize that this group may be a reflection of the Set of Knowledge, forming archetypes from which all other elements are created.

Philosophically, the one probability cloud (s), to be discussed shortly, becoming two (p) signifies an essential polarity created within a unit space. Considering the hypothesis that the form is a 'switching' function that attracts function into form, then this dual manifestation may be viewed as the prerequisite condition by which a larger number of such 'switches' also come into being. This 'essential two' created along three dimensions of space may allow a threshold meta-function experimentation to come into being. Being the first instance of this variability in space it could be that it therefore becomes an attractor for all the essential element-archetypes to precipitate.

But further, the essential elements that allow both thinking and virtual thinking machines to come into being, are also contained within this group. Carbon is the basis of DNA and of all life. The fact the Silicon (Si), directly below it in the periodic table and therefore sharing essential qualities, is considered the basis of all virtual thinking machines is therefore perhaps significant and may reinforce the notion that the p-group is a precipitation of knowledge, as indicated by Equation 12, Knowledge-p_orbital Relationship:

$$Knowledge \propto f(p\_orbital)$$
Eq. 12: Knowledge-p_orbital Relationship

The d-group comprises the Transition Metals. These metals are generally hard and strong, exhibit corrosive resistance, and can be thought of as workhorse elements. Many industrial and well-known elements sit in this group: Titanium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Silver, Platinum, and Gold, amongst others.

The d-orbital itself is a probability space characterized by four lobes around the nucleus. Four lobes occurring in 5 possible planes around the nucleus will likely create a space of stability, since there is a possibility of four lobes creating

the four vertices of a tetrahedron that has been implicitly positioned as one of the most stable shapes (Fuller, 1982). Work done in Crystal Field Theory (UCDAVIS-CFT 2015) reinforces this concept. The general stability of the transition metals is reinforced by the d-orbital arrangement.

Much of the constructed world around us is created from these elements. Further, most of the series in the group easily lose one or more electrons to form a vast array of compounds. It can be seen that these metals exist for service, to help bring about perfection in the constructed world, to help much of the machinery in which they are used, and to assist the processes dependent on them to be completed with diligence. Hence, these transition metals appear to be a precipitation of Presence, as indicated by Equation 13, Presence-d_orbital Relationship:

$$Presence \propto f(d\_orbital)$$
Eq.13: Presence-d_orbital Relationship

Exploring the s-group, one sees that it consists primarily of alkali metals and alkali earth metals. These groups are extremely electropositive easily losing electrons and forming positive ions and releasing a lot of energy while doing so. In his book, Essential Elements (Tweed, 2003), Tweed refers to these groups as the "violent world of the s-block". Gray, in The Elements (Gray, 2009), points out that stars shine because they are transmuting vast amounts of hydrogen into helium, both of which are s-block elements. This characteristic of easily released energy that the elements of this group share suggests that the s-group may parallel or be a precipitation of the architectural set, Power, as indicated by Equation 14, Power-s_orbital Relationship:

$$Power \propto f(s\_orbital)$$
Eq. 14: Power-s_orbital Relationship

Philosophically the s-orbital as a probability cloud indicates the equal likelihood that an electron can be anywhere in a symmetrical sphere around a nucleus. Since all other orbitals can be thought of as occurring within the cloud specified by the s-orbital, in some sense this is like an imprint or precipitation from meta-levels that allows future and more varied meta-functions to more easily precipitate at the level of U. The elements that are part of the s-group may be thought of as the adventurers with courage who venture into a brave new world to create some foundation by which all other element-creations can follow. The fact that H and He constitute 98% of the Universe (Heiserman, 1991) relative to other elements therefore makes sense in this view, especially since H and He provide the fuel with which the star-furnaces manufacture all other elements.

The f-group comprises the Lanthanides and Actinides. Philosophically, the f-orbital, consisting of 6 probability lobes around the nucleus in 7 different planes, implicitly suggesting the notion of extended relationship and collectivity: the attempt to build larger and larger bonds

within a small space. Continuing to draw the link with the quaternary architecture, it is likely that this group is a precipitation of Harmony.

Thinking about Lanthanides, some interesting facts may reinforce this notion:
- First, the spin of electrons in the valence shell is aligned, creating a very strong magnetic field. The notion of creating a strong magnetic field seems to be consistent with the notion of engendering a collectivity through the ordered attraction and repulsion of elements.
- Second, these elements curiously occur together in nature often in the same ores and are chemically interchangeable (Gray, 2009) also suggesting the notion of forming a tight intra-group collectivity.

The following observations as it relates to Actinides can be made:
1. Actinides are inherently radioactive. This implies that these elements have inherently crossed a threshold of stability and have the urge, over their own half-lives, to decompose into other elements. This natural urge may suggest some boundary conditions on the notion of collectivity and nurturing, giving insight into these conditions.
2. The entire Actinide group, as opposed to the Lanthanide group that is inherently stable, is unstable. It is curious that both these should be part of the f-group, and they must provide insight into boundary conditions into the notion of collectivity in elements.

The following equation, Equation 15, Harmony-f_orbital Relationship, summarizes the correlation with Harmony:

$$Harmony \propto f(f\_orbital)$$
Eq. 15: Harmony-f_orbital Relationship

Such fourfold stability implies that memory and universal functionality will also be implementable at this stratum of existence, thus implying the emergence of an atom computational-stratum.

Memory can be conceived as perhaps some reversible reaction in which a particular atom in a molecular conglomerate having dominance and therefore stability, yields to another in the same conglomerate, and vice-versa.

Function may exist by implementing logical gates formed by different groups of atoms that will always react in a predictable way under the influence of the same stimulus.

Further, the creative as opposed to constructive aspect of computation becomes apparent when considering the formation of the potentially vast variety of function-based seeds.

As an example, the seed for the family of Lanthanides with an f-orbital valence shell, is suggested as indicated by Equation 16, Seed-Lanthanides Elaboration:

$$Seed_{Lanthanides}$$

$$= Xa + \overline{Yb_{0-n}} \quad where \begin{bmatrix} X \in [S_H] \\ Y \in [S_{Pr}, S_{Po}, S_K, S_H] \\ a, b \ are \ integers; a > b \end{bmatrix}$$

Eq. 16: Seed-Lanthanides Elaboration

VI. CELL-BASED COMPUTATIONAL STRATUM

Subsequent to the atom computational-stratum, a further quaternary-based computational stratum to emerge is that of molecular plans in any living cell. Such molecular plans can be classified into nucleic acids, polysaccharides, lipids, and proteins.

In 'The Machinery of Life', Goodsell, an Associate Professor of Molecular Biology at the Scripps Research Institute (Goodsell, 2010) suggests that every living thing on Earth uses a similar set of molecules to eat, to breathe, to move, and to reproduce. There are molecular machines that do the myriad things that distinguish living organisms that are identical in all living cells. This nanoscale machinery of cells uses four basic molecular plans with unique chemical personalities: nucleic acids, proteins, lipids, and polysaccharides.

Nucleic acids basically encode information. They store and transmit the genome, the hereditary information needed to keep the cell alive. They function as the cell's librarians and contain information on how to make proteins and when to make them. They are, hence, the keepers of a cell's knowledge, its wisdom, its ability to make laws, the vehicle to spread knowledge within cells and to the next generation of cells. Nucleic acids can therefore be thought of as a precipitation of knowledge at the cellular level, as indicated by Equation 17, Knowledge-Nucleic Acids Set Relationship:

$$S_{K(cell)}$$
$$\ni [Knowledge, Wisdom, Law\ Making, Spread\ of\ Knowl\ ...]$$

Eq. 17: Knowledge-Nucleic Acids Set Relationship

This relationship may also be summarized more simply by Equation 18, Knowledge-Nucleic Acids Simple Relationship:

$$Knowledge \propto f(nucleic\ acids)$$

Eq. 18: Knowledge-Nucleic Acids Simple Relationship

Proteins are the cells work-horses. Proteins are found working in any part of the cell. Proteins are built in thousands of shapes and sizes, each performing a different function. As Goodsell describes, "some are built simply to adopt a defined shape, assembling into rods, nets, hollow spheres, and tubes. Some a molecular motors, using energy to rotate, or flex, or crawl. Many are chemical catalysts that perform chemical reactions atom-by-atom, transferring and transforming chemical groups exactly as needed." With their wide potential for diversity, proteins are constructed to perform most of the everyday tasks of the cells. In fact human cells build around 30,000 different kinds of proteins to execute on the diverse array of cellular level tasks.

Proteins hence, exist for service, to bring about perfection at the level of the cell, are characterized by extreme diligence and perseverance, and so on. Proteins can therefore be thought of as a precipitation of presence at the cellular level as specified by, Equation 19, Presence-Proteins Set Relationship:

$$S_{Pr(cell)}$$
$$\ni [Service, Perfection, Diligence, Perseverance, ...]$$

Eq. 19: Presence-Proteins Set Relationship

This relationship may also be summarized more simply by Equation 20, Presence-Proteins Simple Relationship:

$$Presence \propto f(proteins)$$

Eq. 20: Presence-Proteins Simple Relationship

Lipids by themselves are tiny molecules, but when grouped together form the largest structures of the cell. When placed in water lipid molecules aggregate to form huge waterproof sheets. These sheets easily form boundaries at multiple levels and allow concentrated interactions and work to be performed within a cell. Hence, the nucleus and the mitochondria are contained within lipid-defined compartments. Similarly, each cell itself is contained within a lipid-defined boundary.

Lipids are therefore promoters of relationship, of harmony in the cell, of nurturing the cell-level division of labor, of allowing specialization and uniqueness to emerge, hence perhaps of early forms of compassion and love, and so on. This function of harmonization suggests that lipids can therefore be thought of as a precipitation of harmony at the cellular level as specified by, Equation 21, Harmony-Lipids Set Relationship:

$$S_{H(cell)}$$
$$\ni [Love, Compassion, Harmony, Relationship\ ...]$$

Eq. 21: Harmony-Lipids Set Relationship

This relationship may also be summarized more simply by Equation 22, Harmony-Lipids Simple Relationship:

$$Harmony \propto f(lipids)$$

Eq. 22: Harmony-Lipids Simple Relationship

Polysaccharides are long, often branched chains of sugar molecules. Sugars are covered with hydroxyl groups, which associate to form storage containers. As a result, polysaccharides function as the storehouse of cell's energy. In addition, polysaccharides are also used to build some of the most durable biological structures. The stiff shell of insects, for example are made of long polysaccharides.

Polysaccharides function to create energy, power, courage, strength thereby readying the cell for adventure, and so on. Providing energy and strength, polysaccharides can be thought of as a precipitation of power at the cellular level as specified by, Equation 23, Power-Polysaccharides Set Relationship:

$$S_{Po(cell)} \ni [Power, Courage, Adventure, Justice, \dots]$$
Eq. 23: *Power-Polysaccharides Set Relationship*

This relationship may also be summarized more simply by Equation 24, Power-Polysaccharides Simple Relationship:

$$Power \propto f(polysaccharides)$$
Eq. 24: *Power-Polysaccharides Simple Relationship*

Such fourfold stability implies that memory and universal functionality will also be implementable at this stratum of existence, thus implying the emergence of the cell-based computational-stratum.

Memory can be conceived as a function perhaps of one of the myriad types of cellular proteins that can exist in one or more stable states. The influence of an enzyme can predictably flip the protein from one state to another, thus allowing the operation of memory to come into existence.

Function may exist by implementing logical gates formed by different proteins that will always react in a predictable way under the influence of some stimulus.

Further, the creative as opposed to constructive aspect of computation becomes apparent when considering the formation of the potentially vast variety of function-based seeds.

The seed for the family of proteins, as an example from the layer of cells, is suggested by Equation 25, Seed-Protein Elaboration:

$$Seed_{protein}$$
$$= Xa + \overline{Yb_{0-n}} \quad where \begin{bmatrix} X \in [S_{Pr}] \\ Y \in [S_{Pr}, S_{Po}, S_K, S_H] \\ a, b \ are \ integers; a > b \end{bmatrix}$$
Eq. 25: *Seed-Protein Elaboration*

The preceding equation could yield a vast number of functional proteins: in fact, it may be possible that the 30,000 or so known proteins created by the human cell could each be specified by a signature equation of this nature. It may be possible to map existing proteins to functionality as suggested by the four sets of molecular plans.

VII. SUMMARY & IMPLICATIONS

A symmetrical multi-layered model of light gives new meaning to quanta and suggests a quantum-computational model generative of computational-strata:

$$\begin{bmatrix} C_\infty : [Pr, Po, K, H] \\ (\downarrow R_{C_K} = f(R_{C_\infty})) \\ C_K : [S_{Pr}, S_{Po}, S_K, S_H] \\ (\downarrow R_{C_N} = f(R_{C_K})) \\ C_N : f(S_{Pr} \ x \ S_{Po} \ x \ S_K \ x \ S_H) \\ (\downarrow R_{C_U} = f(R_{C_N})) \\ C_U : [S, T, E, G] \end{bmatrix}_{Light}$$

Space-time-energy-gravity is perceived to come into existence as light precipitates to speed c, also becoming the nature of existence at the quantum veil. Subsequent generated computational-stratum include the electromagnetic field, quantum particles, atoms, and molecular plans, that each have the ability to not only function as universal computational devices, but in addition also shed insight into a process of creative computation in which information surfacing at the quantum-veil is externalized as a vast array of unique and even more complex functionality.

There is, therefore, a logic of computation that exists in and binds together seemingly distinct layers of existence. This logic is based on deep properties of light itself. Visibility into the functioning of these properties in the creation of layers of existence such as the electromagnetic field, quantum particles, atoms, and cells, gives insight into an alternative paradigm of creative as opposed to constructive computation. First, light itself can be perceived as a generator of quaternary-based strata. Second, such strata, afforded stability because the implicit fourfoldness in light seeks integrality even when projected explicitly, allows subsequent phenomenon such as memory and the implementation of universal functionality to arise. Third, because memory and universal functionality can be implemented in any of the quaternary-based emergent strata through the creation of logical gates leveraging strata-specific mechanisms, such strata become computational-strata. Fourth, a different object of computation, an innate creativity, becomes apparent when one considers the vast array of unique functionality that is emergent in any layer of computational-stratum. Such creativity is especially significant at the quantum-level and suggests an alternative interpretation to quantum-level phenomena and an alternative approach to quantum computation. Fifth, genetic-type information itself becomes the output of the creative computation occurring first at the quantum-level, and second, in any computational-strata, which sheds additional insight into the structure and possibilities of genetics itself. Sixth, the first emergent stratum of space-time-energy-gravity must be understood as the very fourfold script that is the substance at the quantum-veil and the very language of all genetic-type information. Seventh, any process of artificial intelligence that does not consider the generation of such quaternary-based computational-strata is by definition severely limited in scope. Eighth, any attempt at sustainable transhumanism

has to include a deep understanding of the symmetrical light-based model and its generation of quaternary-based computational-strata.

Further, the contemporary process of quantum computation needs to be rethought based on the approach suggested in this paper. Since the quantum-veil and even the quantum-particle stratum is perhaps the most complex to understand given current instrumentation and knowledge, and since there could be a similar quaternary-based logic that exists at more visible and understood layers of existence, it may make sense to start from that – molecular plans in cells, for example – and work backwards to more and more subtle layers until the quantum-veil is reached.

There is also an entirely different approach, beyond bits and qubits, to specify computation and build computing devices, that is based on a universal quaternary-logic true of pre-material existence, matter and life.

Such a re-visioning, therefore, potentially gives rise to a vast array of unforeseen technologies, processes, and devices in the areas of computation, genetics, artificial intelligence, and transhumanism.

REFERENCES

[1]   Amato, I. 1991. Speculating in Precious Computronium. Science 23 Aug 1991:   Vol. 253, Issue 5022, pp. 856-857.   DOI: 10.1126/science.253.5022.856

[2]   Arabatzis, T. 2006. Representing Electrons: A Biological Approach to Theoretical Entities. University of Chicago. Chicago

[3]   Einstein, A. 1995. Relativity: The Special and General Theory. New York: Broadway Books.

[4]   Fuller, B. 1982. Synergetics: Explorations in the Geometry of Thinking. MacMillan Publishing Co.: New York

[5]   Goodsell, David. 2010. The Machinery of Life. New York: Springer

[6]   Gray, T. 2009. The Elements: A Visual Exploration of Every Known Atom in the Universe. Black Dog & Levental Publishers. New York.

[7]   Heiserman, D. 1991. Exploring Chemical Elements and their Compounds. McGraw-Hill. New York.

[8]   Malik,P., Pretorius, L., Winzker, D. 2015. A Mathematical Basis of Innovation. Conference Proceedings IAMOT 2015.

[9]   Malik, P. 2018a. Cosmology of Light. Google Books.

[10] Malik, P. 2018b. The Emperor's Quantum Computer. Google Books.

[11] Malik, P. 2019. The Origins and Possibilities of Genetics. Google Books.

[12] Malik, P. Pretorius, L. 2019. An Algorithm for the Emergence of Life Based on a Multi-Layered Symmetry-Based Model of Light. 2019 IEEE 9th Annual Computing and Communication Workshop and Conference (CCWC). 10.1109/CCWC.2019.8666554

[13] Malik, P. 2020a. "Light-Based Interpretation of Quanta and its Implications on Quantum Computing," 2020 10th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, USA, 2020, pp. 0719-0726, doi: 10.1109/CCWC47524.2020.9031279.

[14] Malik, P. 2020b "A Light-Based Quantum-Computational Model of Genetics," 2020 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), Vancouver, BC, Canada, 2020, pp. 1-8, doi: 10.1109/IEMTRONICS51293.2020.9216451.

[15] Olive, K.A et al. 2014. Particle Data Group. Chin. Phys. C, 38, 090001

[16] Overbye, D. 2015. Physicists in Europe Find Tantalizing Hints of a Mysterious New Particle. New York Times. Dec 15, 2015

[17] Perkowitz, S. 2011. Slow Light. London: Imperial College Press

[18] Tweed, M. 2003. Essential Elements: Atoms, Quarks, and the Periodic Table. Walker & Copmany. New York.

[19] UCDAVIS-CFT. 2015. Description of Orbitals.

[20] Wilczek, F. 2016. A Beautiful Question: Finding Nature's Deep Design. New York: Penguin Books

ABOUT THE AUTHOR

As Chief Technologist at Deep Order Technologies, Dr. Pravir Malik has been developing a unified theory and mathematics of organization with applications in a range of complex adaptive systems. He has written 16 books related to this, which includes a recently completed 10-book series on Cosmology of Light to elaborate mathematics with implications in quantum computing, generation of computational strata, genetics, artificial intelligence, and transhumanism.

Dr. Malik was formerly Senior Director and the Head of Organizational Sciences at Zappos.com, and in this capacity led the creation and incubation of organizational development technologies, in support of establishing a resilient organization to withstand the test of time. He also led the Pricing Operations Group at Zappos.com which was responsible for the profitable management of billions of dollars in assets on a daily basis. During his 5+ year tenure, he was an advisor to the CEO, COO, and CHRO on a range of business and organizational issues. In addition, earlier in 2020 he founded Zappos Organizational Sciences Consulting (ZOSC). His final act at ZOSC was the creation of an Organizational Sciences Certification program offered in conjunction with Forbes. Executives from approximately 150 companies participated in this program.

Dr. Malik currently serves as an advisor to several organizations around the world. In the past, he served as a Founding Member of A.T. Kearney India, a top-tier global consulting company, and served as the Managing Director Advisory Services for BSR, a leading global CSR consulting company.

He has a Ph.D. in Technology Management with a focus on Mathematics of Innovation in Complex Adaptive Systems from the University of Pretoria, an MBA from J.L. Kellogg Graduate School of Management with a focus on Marketing and Organizational Behavior, an MS in Computer Science from the University of Florida with a focus on AI, and a BSE in Computer Engineering from Case Western Reserve University.

Pravir is a global citizen who has lived, worked, and been educated in many parts of the world.