MORPHOGENESIS, FORCES AND THE UNIVERSAL CONSTANTS:

TOWARDS A UNIFYING PERSPECTIVE AND PRINCIPLE, WITH IMPLICATIONS FOR SCIENTIFIC PRACTICE

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"The aspiration to truth is more precious than its assured possession."
-----Gotthold Lessing

ABSTRACT: Previous studies of in vitro and in vivo morphogenesis in plants may suggest a more inclusive principle governing biological and physical processes. Forces, including those of adhesion and cohesion, may reflect and enable the deep role of the dimensional, universal physical constants of physics through a constant, regenerative-defining, dimensionless component of those constants. It is the existence of such universal constants from which comes and reflects stability, coherence and constancy in nature through constraints or forces enabled within a neo-aether, and occurring through a non-uniform space-time. These are situations most displayed in biological processes. And a further study of the connections between such universal constants may give us deep insights into such natural processes and situations. Such as, the morphogenic becoming of such situations may thus be shown to reflect specifically a unifying principle governing the stabilization of physical and biological phenomena, with relevance for human society. Published and unpublished information, pertaining to the physical, dimensional universal constants and forces, which indirectly illustrate this proposed principle, is presented. This may serve a heuristic function for devising and conceptualizing new experimental approaches and designs, where an investigation of biological processes becomes a unifying study of and approach to all natural processes through all scales. A biological-based epistemology is also suggested, which should serve the constructive evolution and stabilization of science, especially social science. In this connection, the issue of indeterminacy and determinacy in science is also addressed.

KEYWORDS: Accommodation; Adhesion; Biology; Cohesion; Completion; Correspondence;

Dimensional/dimensionless constants; Evolutionary; Eorce; Fractal; Golden ratio; Morphogenesis; physics; Principle; Stability; Stress; Unifying; Universal

1. INTRODUCTION: BIOLOGY AND A UNIFYING PRINCIPLE: THE ROLE OF THE UNIVERSAL CONSTANTS

Investigations into *in vitro* plant morphogenesis strongly suggest the involvement of cohesive and adhesive force in such development [1, 2]. Biological development is seen as the dynamic accommodation to the stresses of cohesive or adhesive force fields. This situation may be subsumed under a universal principle applying to both biological and physical phenomena. Biology has long sought a unifying principle by which biological processes operated. The embryologist Lev Beloussov argued [3] that were biological research to be more effective, especially investigations of morphogenesis or development, a law must be sought that governs such specific processes, rather than the conventional "instructive" approach by which many current biological investigations are modelled, but which limit complete understanding of what is involved in morphogenesis. I believe this was Lev's general approach to understanding nature.

The approach by the author was to reach towards a unifying principle or law through his and others' research on *in vitro* morphogenesis from plant calli. These investigations suggested that the operation of stressful, non-uniform adhesive and cohesive forces may be necessary for *in vitro* and *in vivo* development of biological organisms, where such development was seen as a means to resolve such stress through the generation of increasing integrity within the organism by means of the progressive and corresponding generation of more uniform, cohesive forces within different levels of the organism. And that the behavior or pattern of such forces, their operation in the natural world, may provide a portal to a universal law or principle, applicable to both physics and biology, and one governing underlying dynamical processes in the universe. Thereby, knowledge of such a principle may provide new unifying insights into physics and biology, especially as to the proposed stabilizing patterns of adhesive, cohesive, and mechanical forces between the micro- and macro-domains of existence.

In the late 1960s, the embryologist and geneticist, C. H. Waddington, organized a series of conferences through which a unity of theoretical concepts

could be arrived at, and relevant significant questions asked. This would apply towards achieving a more constructive view of biology. A unifying perspective on biology was sought. Scientists of various disciples participated, including the physicist and engineer, Paul Lieber.

In an article stemming from one such conference, Paul Lieber proposed that the dimensional, universal physical constants of physics are manifestations of a deeper domain of processes in existence, which are inaccessible. "It is the existence of a set of dimensional universal constants in nature from which constancy and stability apparently comes. The existence of the Dimensional Universal Constants imply that the ultimate processes with which they are identified in nature are in principle inaccessible"[4]. By being universal in reality, such constants and the processes they manifest, as well as the immutable features they project, would also apply to or be involved in biological phenomena [4]. And in so doing, this would enable a particular perspective, reflecting a deeper, universal principle or process manifested and maintained through forces of various types. That at all levels of organization within the natural world, *forces* would arise from an underlying domain of reality. This would be an ultra-physical reality, manifested and projected into space-time through the universal constants, as developing and stabilizing force-configurations of space-time. And these would be the dynamical means to provide the necessary stability to and constancy within developing and evolving phenomena at all scales of reality.

The physical, dimensional universal constants, according to Paul Lieber, would manifest or define or characterize that dynamical drive towards a more complete stability and constancy within and connecting various phenomena, including biological processes, at all levels of organization, which reflects a principle of universal correspondence in nature. As he described, the generation of increasing stability and constancy through the transformation of stressful force configurations into increasingly more uniform, less stressful configurations, occurs in nature, not only in the development or morphogenesis of organisms but through the very evolution of organisms, and throughout all levels of existence [5]. The existence of the Planck constant, h, represents a stabilization of electron orbitals and associated energy levels within an atom, and thereby defines processes which contribute to the stabilization of the atom, consequently the stabilization of the chemical elements and molecules, and through such stable

molecules and their stable interconnections, to the adaptive stabilization of matter and of life itself.

This process points to a universal principle reflected by or arrived through the existence of the universal constants, and the universal immutable features which they project or characterize. This suggests the universe as being an evolutionary and resolving process towards greater stability and integrity of structure and a growing, internal constancy and coherence within phenomena, ultimately enabled dynamically through these projected, immutable features. Paul Lieber referred to these immutable features as the universals. This evolutionary process may suggest that the second law of thermodynamics is but a limiting case, as applied to existence. As Paul Lieber stated in 1968 [4]:

> The reason the history of nature does not comply with Carnot's principle, is that the domain of the universal constants constantly and irreversibly impresses (by impressing active stringent constraints) on the space-time manifold structure and thus non-uniformity, which averts the evolution of the thermal death (the total uniform heat bath) [in the spatial-temporal domain] implied by Carnot's Principle, which applies only to the first domain [as a highly limited case.]

This is the domain of "ordinary sense experience," or the spatial-temporal domain and the natural phenomena within that domain. The primary feature of such phenomena is their uniformity in non-uniformity of force configurations. Evolution becomes the generation of increasing uniformity throughout non-uniformity, via the dynamical completion of ever generated non-uniform configurations, with a concurrent reduction of internal stress and an increasing stability, coherence, and integrity within the biological and physical domains, and thereby accommodation and adaptation to dynamic milieus. Such evolution, which puts stringent boundaries on Carnot's principle, would involve and enable the physical and biological correspondence of different scales of reality.

2. TOWARDS A UNIFYING VIEW INVOLVING THE DIMENSIONLESS BIOLOGICAL CONSTANT, 1.618, AND ITS ACTIVE OCCURRENCE THROUGH UNIVERSAL CORRESPONDENCE IN NATURE

A dimensionless, universal biological constant of a particular value, known as the golden ratio, which becomes manifested in plant growth and development, appears to compose many of the dimensional universal physical constants, as

made evident through factoring such constants. This dimensionless biological constant connects them, underlies and unifies their operation in nature. And it is not an arbitrary value, which changes with the units or scale used, but a value whose detection or appearance is repeatably enabled through a constant parameter of the metric system. This constant parameter is π, and it is a parameter that has enabled the existence of the metric system itself [6]. The very existence of the metric system has enabled the very detection of the physical, dimensional universal constants themselves, and this would include their dimensionless components. The existence of the dimensionless biological constant in nature appears to actively reflect or characterize, through various forces, including cohesive and adhesive forces, a vortical regeneration and sustenance of stability and constancy in nature through dynamic completion, a creative bringing together. It does so through various levels of nature. And it gives a fractal structure to nature.

Specifically, many of the dimensional universal constants of physics are composed of a dimensionless value, 1.618, which the author has designated as Φ, while other constants are composed of its reciprocal, 0.618 or Φ^{-1}. (For examples, the reader is directed to [6, 7].) One example is the electric charge constant of respectively protons and electrons, e, which could define or be at the basis of adhesive forces. The charge constant is 1.602×10^{-19} coulombs (units of electric charge). 1.618, in value, is not significantly different from 1.602, as would be shown by statistical methodology. In fact, they are nearly identical, which cannot be regarded as a coincidence. The appearance of Φ even occurs when the charge constant is expressed in e. s. u (electric-static-units), in which the charge constant is 4.803×10^{-10} e.s.u. Factoring, gives the expression $3\Phi \times 10^{-10}$ e.s.u. For the charge constant in terms of e.s u., Φ is still present, though in a different context, involving the integer, 3. Even though the integer 3 appears, Φ nevertheless composes the charge constant independently of the units or scale used. The integer 3 may have some type of significance or physical meaning, which could be investigated.

Furthermore, the numeral 10 component in this and many dimensional constants is almost equal to Pi squared or π^2. Pi squared is equal to 9.86, which, when rounded up over an extremely small, insignificant interval, certainly equals 10. From another standpoint, the square root of ten is 3.16 and π is 3.14. These

values cannot be regarded as being significantly different through a statistical analysis. They are in fact virtually identical. The mathematician, E. D. Smith noted that the square root of 10 is π. He also pointed out that this was known to mathematicians in ancient India [8]. This would bring to bear another important dimensionless constant that plays a role as another component of the universal, dimensional constants. This would be π^2 occurring in place of 10, when 10 is present as a factor within the physical dimensional constants.

As noted, the dimensionless constant Φ or its reciprocal, appearing as a factor within the dimensional universal constants, is considered as being a biological, dimensionless constant. One major reason for its biological designation or feature is that Φ's value becomes manifested, as a constant rate of growth, in the logarithmic spiral patterns of plant development, in the logarithmic spirals of shells of various invertebrate animals, very probably in the spiral development of the horns of rams and related animals, and most likely through the spirals manifested in human anatomy. Also, surrounding the respective capillaries in the web feet of frogs, muscle fibers are arranged as spirals in the form of helices. (For a comprehensive representation with respect to spirals in nature, see [9].)

Regarding each such helix, it may be found to exhibit Φ if one were to determine the ratio of the distance of one cycle of the helix to its diameter distance. As will be pointed out subsequently in this article, such a ratio of distances in the DNA double-helix was found to be 1.618. Thereby, Φ also becomes represented in the context of a stable inheritance of organisms. Most relevantly, a 65 million-old fossil of a mollusk has a shape that clearly resembles a logarithmic spiral having the growth ratio Φ, perhaps indicating that the biological constant Φ has been significantly relevant, if not necessary, to life for millions of years, an effective constant through time for the biological and physical worlds.

In this regard, Φ has defined or has characterized and does define or characterize a regeneration process that could stabilize an organism and various physical phenomena. This process becomes manifested in the generation of a spiral or vortex at a constant rate, and this vortical process or dynamical pattern is represented in a self-similar manner through many scales and features of nature, physical and biological, and thereby would appear universal [6, 7]. The dimensionless biological constant defines and manifests directly, or through its

reciprocal, the constant rate of growth or regeneration at different scales of these vortical or spiral processes necessary for stabilization.

In general, such vortices or spirals or conical helices grow or regenerate at various scales over 90 degrees by a constant, dimensionless ratio or rate having the quotient value of 1.618. This dimensionless constant along with π^2 unites many of the dimensional universal physical constants, and by doing so, could define or characterize or reflect a stabilizing, curvilinear regeneration process or dynamic through all scales of nature. This means that the dimensionless biological constant or its reciprocal, along with π^2, could characterize and define a universal correspondence throughout nature. Some vortices in nature or in space-time may regenerate at ratios other than 1.618, and these growth ratios or rates might represent other types of dimensionless biological constants, which might be found in a few of the dimensional physical constants.

Regarding the reflection of such universal correspondence through the dimensionless biological constant, 1.618, the quadrants formed through intersecting logarithmic spirals of force arising through a field, generating or growing at the constant rate of 1.618 through the field, could represent quanta of action, and thus be represented by the quantum of action constant, h. This constant is $4\Phi \times 10^{-34}$ Joules-sec, when expressed in terms of mechanical, kinetic energy or Joules. The integer four could define the quadrant demarcation of the constant through spiral or vortical intersections within a field marking the generation and boundaries of the quanta [6]. This would be an example of dynamic continuity giving rise to dynamic discontinuity, the latter being the hallmark of quantum processes.

A pine cone morphologically could represent such quantum processes at the macro-level, where logarithmic spirals, growing at the rate of Φ, intersect in quadrants, in which seeds are produced in the pine cone. This seed quadrants may very well be respective regions of potential energy quanta at the macro-level A pine cone might morphologically also correspond to the nucleus of an atom and the quanta, as protons and neutrons, stabilized with the nucleus. (For a detailed elaboration of this, see [6].) All of these morphological generating processes would be defined or guided by a dimensionless biological constant, the dynamic geometry that it manifests.

Various investigations of and views pertaining to i*n vitro* and *in vivo* plant

morphogenesis, as referenced earlier [1, 2], may point to deeper dynamical processes in nature represented globally by the biological constant through the universal dimensional constants into the domains of physics and biology, so as to generate stability and constancy within those domains. In effect, pointing to such global, lawful guidance is indicated a dimensionless biological constant along with π^2, composing and uniting the dimensional universal constants. This perspective may provide biology with the unifying theory long sought by it.

3. UNIVERSAL CORRESPONDENCE MADE EVIDENT THROUGH ALL SCALES OF NATURE: VARIOUS EXAMPLES

This unifying theory would also apply to physics and would suggest a regenerative feature to physical nature to enforce stability and constancy throughout all scales of reality. This would be a regenerative feature enabled by forces arising from a deeper, underlying, ultra-physical domain of existence, such as a non-uniform plenum or neo-aether, into the domains of physics and biology, and patterned lawfully by means of various universal constants, through all domains of nature via the regenerative features of such domains. As an inner component to such constants, the regenerative features or patterns of those domains become manifest or characterized through the existence of the universal, dimensionless biological constant. We have seen how these corresponding, regenerative patterns of development at different levels of organization could be represented by the correspondence of a pine cone to an atomic nucleus and to how a pine cone could represent quanta of action at the macro-level through intersecting logarithmic spirals, which generate at a ratio of 1.618.

This could be regenerative-defining features or patterns of generation that would unite the domain of quantum mechanics, the middle physical domains of whirlpools and hurricanes in fluids, the biological domain, and the cosmological domain, as reflected by general relativity, where vortical or logarithmic spiral galaxies reside. And in the respective cores or center regions of many such galaxies are Schwarzschild-Kottler black holes. In such holes, "we find the golden ratio in the geodesic structure of a black hole" [10]. This would be regenerative-defining features through a principle of universal correspondence of the dynamic behavior or generative pattern of each scale of reality with any other scale.

Such correspondence would thus have biological properties or structures. It would give the internal relationships of physical phenomena, biological features, such as of regeneration and creative accommodation. "By having biological properties, the various phenomena of existence, on various scales, including those represented by quantum mechanical models, could essentially be re-interpreted as being adaptive designs or configurations." From this standpoint, whether light behaves as advancing or propagating waves of electromagnetic force, or as coordinating corpuscles of electromagnetic energy, depends on what is the most adaptive, dynamic, physical configuration or morphology to a given dynamic milieu or experimental situation [6].

There is also a significant physical relationship that could have the biological property of stability via regeneration, through which, a dimensional universal constant is involved. This is the relationship, $e/m = c^2$. As noted by Paul Lieber in unpublished materials, an example of a feature of universal correspondence is the physical relationship, $e/m = c^2$, where e denotes the energy of a system, m denotes its mass, and c is the constant speed of light in a vacuum. As can be illustrated, $e/m = c^2$, which follows from $e = mc^2$, indicates that variations in energy through acceleration of mass correspondingly generate variations in mass, and variations in mass correspondingly generate variations or changes in energy, such as electromagnetic radiations, and that this correspondence of connected variations, or their dynamical patterns, is always constant or uniform or stable, that is c^2, through all the scales of existence. As c equals $5\Phi^{-1} \times 10^8$ meters per second (or $3\Phi^{-1} \times 10^3$ miles per second), it would appear that Φ represents or defines a vortical, regenerative dynamic in this situation, which connects or unites mass, acceleration (increasing inertial or gravitational force), and electromagnetic energy, through a constant advancement per second of waves of regenerating electromagnetic force. And this would be a constant advancement of regenerating, electromagnetic waves, due to accelerating/oscillating electrons or electric charges, which would enable this type of universal correspondence. (See, [11], which gives a description of accelerating/oscillating electron charges and their role in constantly generating electromagnetic waves.)

The maintenance or enforcement or manifestation of such correspondence might be by means of the regeneration process itself through different scales,

marked and represented by Φ. Through $e/m = c^2$, the inertial and electromagnetic forces appear correspondingly connected, across all scales, perhaps through the regeneration process marked and represented by Φ . Accelerating electrons and implicitly their accelerating charges would also produce inertial forces, and these would be involved, possibly in a completing manner, in the generation of the constant traveling of oscillating, joined electric and magnetic force fields composing the waves of electromagnetic radiation. This shows a deep connection, if not correspondence, between two dimensional universal constants, namely the electric charge constant and the constant speed of light or of electromagnetic radiation. And which deep connection may be due to that which Φ refers.

The enforcement of the correspondence mentioned above would be from the quantum level to the cosmological level. In such generation of corresponding, connected variations, irrespective of scale, does constancy become manifest or shown to be necessary for such connected correspondence to manifest or arise, irrespective of scale and time. Such constancy, demonstrated and enabled through a transcalar vortical regeneration, as reflected through corresponding, dynamically connected variations, is also a manifestation of unity in mass-energy, or unity through encompassing, generative forces. These generative forces, guided geometrically via that process which the dimensionless biological constant represents, would bind the variations in mass-energy together, correspondingly, stably, and more and more completely, through all scales and times, that is, through all scales of space-time. Such variations would manifest as adaptive, stable developments.

The constant c, the speed of light in a vacuum, or what could be the considered structurally as the constant regeneration of waves of electromagnetic force, also reflects or enables, with its dimensionless parameter or biological component, this particular feature of a principle of universal correspondence. And such constant regeneration becomes manifested through it. Implicit in this process of correspondence would be a completion dynamic, such as a unification of magnetic force fields, electric forces fields, inertial forces fields, and electron quanta, occurring through an enveloping regeneration of completing forces. Various types of forces and quanta become correspondingly united through a generative, vortical force.

As indicated, the unifying regeneration involved in the constant speed of electromagnetic radiations would involve the acceleration and oscillations of electrons and their charges. As one will recall, the dimensional constant for the electric charge of an electron is clearly composed of Φ. And the deep involvement of electric charge oscillation and acceleration via accelerating/oscillating electrons in the constant regeneration of electromagnetic waves demonstrates again the major involvement of the vortical dynamic for which Φ represents in the generation of the constant speed of light and the universal correspondence involving that constant speed of that generation. In effect, this unifying process or dynamic could be characterized through the dimensionless biological constant.

One wonders whether the constant regeneration or propagation of waves of electromagnetic force, originally connected to accelerating quanta with wave properties, itself takes on a helical or vortical geometry through scales of space-time. Also, one wonders whether such geometry is a parameter for universal correspondence.

Another example of this process of universal correspondence in nature would be a physical phenomenon, experimentally demonstrated, at first with electrons, and originally proposed by the French physicist De Broglie. This phenomena is represented by $\lambda = h/mv$ (or $mv\lambda = h$) , where λ represents the associated wave length of waves connected with a moving particle, such as an electron or mass at larger scales, such as molecules [11]. The m in the equation refers to the mass of the particle, such as an electron, which might also be considered as a compressed regenerative vortex, v being its velocity and h being the constant quantum of action, Planck's constant. Respective electrons moving around a nucleus of any atom respectively generate standing waves, stabilizing their discontinuous orbitals of any atom, and of all atoms in molecules. This might be extensions of their possible regenerative vorticity. These stabilizing processes within all atoms in all scales of matter throughout space-time clearly involves the existence of the Planck's constant, h, in nature. As noted by A. Einstein, the forces that enable electrons to move around atomic nuclei are the same forces that enable the planets to move around the sun. These are stabilizing gravitational forces, such as centrifugal forces, operating across different scales, and thereby, these forces also indicate the operation of a stabilizing universal correspondence.

Thus, the Planck's constant would also point to this stabilizing process, involving effects of gravitation, that is implicated in the stabilization of electron orbitals.

The Planck's constant, as noted, is composed of the biological constant 1.618, or Φ, and which suggests the quantum of action has regenerative features, and which could be extended into the generation of bands of vortical waves in the atom. These bands would correspond to the different, discontinuous energy levels within and which manifest the stability of the atom. These bands could be stabilized or defined through constantly generative, spiral intersections, involving various forces, as reflected through Planck's constant.

As experiments have shown, the electrons' movements or energies would determine the length of their waves, the various lengths corresponding to the various energies. And this has been shown to apply to much larger masses, such as molecules As the momentum, mv, increases, through acceleration of a particle or electron mass, which suggests the increasing involvement of inertial or gravitational forces, the wave length of the electron or regenerative structure correspondingly decreases, with an increase in energy, and hence mass, while a decrease in momentum, mv, of the electron or compressed vortex corresponds to a increase in its wave length and a decrease in energy and its mass. This situation involving mv or mass-energy and contingent waves, possibly vortical, can occur within all scales of reality, and thereby represents a universal correspondence that is stabilized, perhaps via vortical regeneration through all scales.

The Planck constant shows that this situation is constant through all scales of reality or space-time, playing a unifying role that appears to enforce correspondence across all levels of nature. That is, this process of stabilization through all levels or scales is defined or characterized by Planck's constant, and more deeply or underlyingly, occurring through or involving the existence of Φ within Planck's constant and within the other dimensional, universal constants, and thereby, manifested throughout nature. This is because Φ could be considered as representing or manifesting a regenerative dynamic operating through the vortical intersections via all scales of nature. This represents or reflects a vortical dynamic that brings forth a universal correspondence of phenomena through Φ. In doing so, Φ would appear to represent a unification of the micro-realm with the macro-realm, while also representing a uniting of a wave property of mass-energy with a corpuscular, vortical configuration of mass-

energy. Through such unification, a type of completion and stabilization of phenomena is achieved, perhaps through a vortically structural regeneration dynamic, with regenerating intersections, possibly manifesting as vortical quanta, when stably adaptive. This would be an adaptive dynamic of self-similar completion and stabilization, which operates universally.

Such dynamics of progressive completion, a type of morphogenesis, enabled through universal dynamical, generative connections to an ultra-physical domain, would correspond stably and morphogenically with one another through all scales of space- time, and hence universally. And such corresponding completion within and via variation through all scales of space-time would be the underlying dynamic of the universal principle of correspondence, as exemplified by $e/m = c^2$ and $\lambda = h/mv$. These important relationships become apparent through the Special Theory of Relativity and quantum mechanics. In fact, $\lambda = h/mv$ represents a unification of the Special Theory of Relativity with quantum mechanics [11].

Moreover, $\lambda = h/mv$ may also unite with General Relativity, as inertial or gravitational forces are implicitly involved in the unification. Specifically, an increasing momentum (mv) of the electrons would generate inertial forces connected to the electrons and their electromagnetic fields. And this unification would prevail through all scales of reality and be stably enabled and defined through that which the dimensionless biological constant, Φ, represents within the Planck constant. The Planck constant may thus have a unifying bearing on General Relativity. Furthermore, this unification and the phenomena it illustrates are constrained, and thereby specified, and in a manner of speaking, structured via forces, through the constants, c and h, and perhaps also through the gravitational constant as well. And thereby, such unification and related stabilization manifests implicitly through the vortical dynamic manifested by Φ. All theories and their illustrated phenomena would be constrained and thereby structured and specified through their universal constants (from Paul Lieber's unpublished materials addressing Sir Arthur Eddington's Fundamental theory).

It would follow that such structuring and specification, via the avenues represented by the constants, enable and make manifest the principle of universal correspondence of dynamic structuring of patterns or morphologies. Such morphologies would thus be sustained or enabled by constraints defined by the

universal constants through forces. And these could be manifested as dynamical, regenerating vortices within fields. And through their regeneration, such vortices could also generate derivative morphologies. The regeneration of such vortices, and their derivatives, through all scales would be reflected or charactrized by Φ as an underlying universal biological constant. This would also appear to represent a guidance of such vortices towards adaptive, dynamic completion within various phenomena of morphogenic features. This could be subject to investigation.

4. MORE EXAMPLES OF UNIVERSAL CORRESPONDENCE THROUGH ALL SCALES OF NATURE ENABLED THROUGH AN ACCOMMODATING, VORTICAL REGENERATION

As is also localized and exhibited in the morphologies of many plants, another structural feature or aspect of a principle of universal correspondence, in addition to the feature reflected by $e/m = c^2$, would also suggest that reality has a particular, encompassing structure or morphology. In general, through the underlying dimensionless, biological constant, the existence of all the constants could represent a guiding role in structuring, via forces, such a morphology, which also embodies a principle of universal correspondence. This morphology would be exhibited as a self-similar or fractal structure of reality, perhaps of intersecting vortices within vortices, defining self-similar, completing quanta at various scales, with a constant, inaccessible inner core or domain. This would be a fractal morphology especially manifested in many examples of plant morphology. This would be a fractal universal morphology that is always, and thus constantly, completing itself correspondingly, vortically and dynamically, and so stably, at different scales, its ever generated non-uniformities, to be completed through various scales. Hence, this would be a globally lawful and creative situation manifesting constancy, enabled through that universal, vortical dynamic, which Φ represents through a guiding role. This would be an accommodating or adaptive, dynamic situation of completion.

5. CORRESPONDENCE OF THE RECIPROCAL OF THE FINE STRUCTURE CONSTANT WITH A CONSTANT OF PHYLLOTAXIS: REFLECTION OF AN ADAPTATION INVOLVING THE MICRO-COSMOS

This universal correspondence of a regenerative and stabilization process may also be illustrated in the relationship between the reciprocal of the fine structure constant present in quantum mechanics and the constant angle of phyllotaxis in plants. The fine structure constant, which is dimensionless, pertains to the generation of fine structure in light spectra emitted by atoms, involving electron spin in a magnetic field. The spin, which also generates a magnetic field or moment, could also be considered as the vortex of an electron. The reciprocal of this constant is the value 137.03 or $360/\Phi^2$. The phyllotaxis constant in plants defines the constant angle between buds or leaves of a plant developmentally arranged or occurring along a pattern of a logarithmic spiral. And this particular angle, which is generated between emerging buds or leaves, is very adaptive for the plant, especially with regard to its exposure to necessary light frequencies or electromagnetic spectra. The value of this angle is 137.5 degrees or $360^o/\Phi^2$ or in terms of radians, $2\pi/\Phi^2$ radians. It is valid to compare these values, as to the significance of their identity, even if one value is in terms of degrees, inasmuch as one degree equals Φ^{-1}. This follows from the fact that $6\ \Phi^{-1} \times 10^2$ equals approximately 360^o.

The numerical identity between these two constants, involving Φ, has a significant meaning or implication. Such an identity or correspondence of these constants emphasizes that both, respectively from apparently completely different domains or orders of existence, the quantum mechanical and the developmental domain of biology, nevertheless point to a deep, corresponding underlying dynamical connection between the two. "This underlying, adaptive process involves the dynamical intersecting-continuities of undifferentiated force represented by i/Q [the biological constant], and through which, the quantum of action, h, becomes defined" [6]. This would represent a universal correspondence, and one involving the developmental regeneration of intersecting vortical processes through all scales, and the associated manifestation or generation of discontinuity, such as spectral lines, of which some might be very critical for plant life. Such spectral lines would be occurring through electron spins intersecting with magnetic fields and electrons (and their waves) moving to

or emerging with lower energy levels in the atom.

6. THE DIMENSIONLESS BIOLOGICAL CONSTANT EXPERIMENTALLY MANIFESTED IN PHYSICS AND CHEMISTRY

Most relevantly, an investigation on the wave lengths for hydrogen atom spectral lines has shown that the "positions of these lines in the spectrum can be represented by simple functions of the golden proportion," which is the golden ratio or Φ [12]. They also refer to studies where the "golden proportion is applied to interpret spectral properties of condensed matters." And related studies pertaining to quantum states in crystals, show a "golden ratio entanglement in a hexagonally poled [photonic] nonlinear crystals" [13]. Furthermore, overlapping decagon quasi-crystals are arranged on planes in metals whereby the totality of overlapping quasi-crystals on a plane has maximum stability. And the collective geometry of these overlapping, decagon quasi-crystals on a plane manifests a golden ratio, as well as the individual decagon quasi-crystals themselves. And these quasi-crystals may be clusters of atoms sharing clusters with other clusters [14, 15, and 16].

This suggests that the arrangement or pattern of forces sustaining this stability through this geometry of the overlapping crystals on a plane is dynamically contingent on the golden ratio or Φ being present throughout the geometry. Perhaps, these clusters of atoms are interconnected by vortical, yet stable patterns of forces through the different planes enabled by a geometry defined by and occurring through Φ. When quartz crystals are exposed to polarized light, the silicon and oxygen atoms composing the crystals are found to be respectively arranged as right-hand and left-hand helices (in [9], from a 1911 publication in *Nature* by Alfred Tutton). And, as also noted by Cook [9], with a photograph, crystals of sulfur display a spiral morphology.

This spiral dynamic in physics extends beyond crystals. Under particular conditions, when electrons move in a magnetic force field, the electrons move in helical or vortical curves or vortical waves [17]. This indicates that, under particular conditions, the magnetic force field not only takes takes on a vortical, guiding structure in relation to the electrons, the electrons themselves exhibit vortical behavior. Relevantly, the nuclear magneton constant shows an important relationship. This is a relationship between magnetic flux, which is a magnetic

force field, possibly vortical, around the moving or spinning proton nucleus of a hydrogen atom and the contribution of such flux to the atom's energy. The constant is 5.059 x 10^{-27} Joules per Weber/meter^2. The Weber is a unit of magnetic flux. This dimensional constant can also be expressed as $\Phi\pi$ x 10^{-27} Joules per Weber/meter^2 or as $\Phi\pi$ x $(\pi^2)^{-27}$ Joules per Weber/meter^2. The key dimensionless and constant components, Φ and π, become clearly evident in a magnetic process at the atomic level.

In view of these findings, Φ's constant involvement and manifestation in physics again becomes evident, especially as it appears to be involved in helical patterns in crystals and in the vortical configurations of force fields and masses, and energies. And Φ's constant involvement and manifestation in physics would be a reflection of its involvement in the dimensional physical constants and its representation or reflection of an underlying vorticity of regeneration.

If this is also the situation of regenerative, vortical processes throughout reality, defined and guided by what Φ's existence represents, it can be predicted that even on the micro or quantum mechanical scale other vortical structures or morphologies would be present. In fact, experiments indicate that streams of protons behave as vortices [18]. And it is possible that Q could apply to or represent the generation or regeneration of such proton-vortices. Relevantly, the ratio of proton mass to electron mass is a universal, dimensionless constant, which is 1836. This dimensionless value, expressed or factored in terms of 0.618 or Φ^{-1} and π, is $3\Phi^{-1}$ x $(\pi^2)^3$. Interestingly, the integer 3 appears in this situation, as well, which might be some type of tie-in to the charge constant.

If electrons can also generally exist as regenerative vortices, which appears to be the situation in view of their wave structure and spin behavior, and their vortical behavior in magnetic force fields, as described above, then the constancy of this mass ratio, through all levels of organization of proton and electron mass, connected to atomic number in atoms, takes on a deeper significance. And such constancy would be another example of universal correspondence and its stability. This would ultimately rest on a vortical regeneration defined or reflected by Φ. That organization of the atomic numbers in the atoms, representing proton and electron mass of all the chemical elements, is presented in the periodic table of chemical elements.

The stable or constant arrangement of the chemical elements as represented in the periodic table is based upon the quantum mechanics of atomic interactions, and thereby is ultimately based on what Planck's constant represents. That constant, in terms of the energy of electron-volts, rather than mechanical, kinetic energy, Joules, is also, in terms of Φ, equal to $\Phi^3 \times 10^{-15}$ electron volt-sec. Even within this different form or expression of energy, Φ is still present. And it appears that Φ, by being part of what Planck's constant represents, is very relevant to or reflects the generative stabilization and adaptive relationship of the chemical elements within the periodic table.

Based on an analysis of atomic weights of chemical elements with respect to their volumes, it was shown that the "relations of all the known [chemical] elements could almost exactly be expressed by a logarithmic spiral" ([9] in reference to research by Dr. Johnstone Stoney.) At that time, 83 chemical elements were known. As pointed out by Cook [9], the spiral arrangement of the chemical elements included the Mendeleev Periodic System. This clearly indicates again the likely involvement of Φ's defined reality, which generatively, deterministically and guidingly manifests through Planck's constant within a universal chemical or physical organization. This would be an organization sustained by a quantum mechanics based on Planck's constant, but at a more inclusive scale.

7. DETERMINACY, INDETERMINACY, AND THEIR BOUNDARIES RELATED TO WHAT Φ REPRESENTS: THE GENERATION OF ACCOMMODATING NATURAL DESIGNS

A type of accommodating, stablizing determinacy, which appears contingent on that which Φ represents and characterizes guidingly, is indicated through all these scales. And this includes the quantum mechanical level. However, the inaccessibility of the underlying, ultimate, ultra-physical processes in all scales, reflected by the universal constants and their dimensionless parameters, makes their elucidation through experiment very incomplete, if not impossible at our stage of cognitive evolution and thereby indeterminate in those circumstances. The very pattern of constraints, immutable and autonomous in themselves, imposed by the domain of the universal constants on space-time via a neo-aether, define and dynamically shape such inaccessibility and the boundaries of

determinacy and indeterminacy in experimentation. This generates limits to our experimental control or certainty via the application of force, as experimentation itself implicates the use of forces. Currently, such experimentation does not enable the use of forces to access ultra-physical, immutable processes. These forces constrain experimentation from doing so, but do not inhibit the evolution of effective experimentation. They enable such, which could allow an evolution towards accessibility. In this regard, Paul Lieber points out in unpublished materials:

> The primacy and autonomy of force relative to the design and mathematical construction of the Principles of Physical Theory has been demonstrated incisively. This leads to a new fundamental and general Principle of Dynamical Indeterminacy, which can be read as a radical generalization of the Uncertainty Principle of Quantum Mechanics. This general Principle of Dynamical Indeterminacy shows that forces and their infrastructure [the ultra-physical, underlying processes] are not determined by, and thus not reducible to, [or elucidated by] Physical Theory, that is, to its First Principles, which they [the forces and their infrastructure] Dynamically enforce and sustain, [their constancy, and through which forces, the universal constants become manifest as the templates of stability in nature.]

In view of this, he conjectures that the origin, behavior and evolution of forces could be subsumed under a universal dynamical principle, which is marked by the universal constants and the ultra-physical processes from which such constants arise and reflect, and which the doctrines of physical theory, especially through experimentation, cannot completely describe at this time. Furthermore, Paul Lieber describes natural designs sustained and innerly constrained, and thereby specified, by the existence of the universal constants through forces, their instantaneous connections, and which designs, through their responsive force configurations to non-uniform stress, evolve. These designs, which would also include experimental designs and systems, are what we would consider as the physical and biological systems composing existence. The force configurations of such systems or natural designs evolve, through instantaneous, non-uniform dynamic connections to a universal niche or ultra-physical domain, such that they achieve a greater dynamical uniformity in diversity, a hierarchy of dynamically increasing internal stability and constancy throughout all scales of existence, and thereby adaptive. Potentially, experimental designs would also evolve in the same dynamic manner.

Such instantaneous force connections to an ultra-physical domain, enabling

completion, sustain the evolution and stability of these natural designs, their internal constancy, and thereby their reproducibility at all scales. Ultimately, this situation could be through regenerative, vortical processes, themselves morphological, and their intersections, represented or manifested guidingly by **Φ** as a component or factor within many of the universal dimensional constants. Such natural designs could be seen as derivative, self-similar morphologies coming into existence through vortical regeneration as a manifestation through **Φ**.

Though Paul Lieber did not refer to the possibility of such a dimensionless biological constant, his views and research, especially in hydrodynamics, nevertheless indicates universal regenerative processes, which are structured or guided by constant constraints, as reflected by the universal constants and their dimensionless biological components. Such serve the evolution of stability and ordered complexity across various scales in nature, and the manifestation of an enabling constancy through such.

As Paul Lieber noted above, this evolution cannot be completely explicated by the principles of physical theory, but it is subsumed, along with its explication, under a dynamical evolutionary principle, which is manifested at all scales of nature. This principle would enable, and account for, the universal correspondence of the dynamics of uniformity in diversity, and the evolved degrees of self-similarity of morphology, through all scales of every aspect or phenomenon of nature. "By this thinking every natural phenomenon, classical as well as non-classical, is in effect a micro-cosmos of the universe" [5]. In this regard and also *a propos* to determinacy and indeterminacy in nature, Paul Lieber writes:

> The [adaptive] bio-integrity of a biological design is determined by the degree of fidelity it dynamically expresses the ultimate Universal Law or Principle. The bio-integrity of a design determines [and enables through forces, such as adhesive forces] its stability/persistence and power of survival [Paul Lieber, unpublished].

Yet, he sees that all natural designs can only be approximations, because they are not perfect in expressing the universal, substantial dynamical evolutionary principle. In his view, such designs are in a constant, accommodating quest for expressing or manifesting this principle. And because of their imperfection, they manifest a degree of indeterminacy with respect to one another. This would

include experimental designs relative to natural designs.

Through this evolution, human minds will also evolve. And because of this evolution, our concepts, experimental investigations and necessary techniques will evolve as well. This should enable humans at some distant time to eventually begin access, perhaps through mind, to those deeper, ultimate processes bearing on and contributing to that universal, evolutionary law or principle implicit in physics as well as in biology. And thereby, this would enable human beings to begin achieving an ultimate, universal adaptation and insight, which would be reflected in a benign human society.

Such a feasible view, though not completely established, may nevertheless prove heuristic for and encourage research on many scales. Such research would be directed towards an increasing understanding of constancy in nature, its constraints via forces in creatively structuring natural designs, which also includes theories, and thereby, its role in enabling a universal evolution addressing and reconciling constraining, non-uniform forces (or dynamic non-uniformities) of various types throughout all levels of existence. This would become the situation through producing increasing dynamical uniformity, via generative or regenerative completion, within diversity or non-uniformity, and thereby creatively increasing coherence and accommodation.. "By this thinking, all forces are endowed with the [guiding or governing] universals, and are the manifestations in direct experience of a universal law of evolution, which refers to the actions of the universals [via the constants of nature] on the space-time manifold to which I ascribe everywhere the ontological-geometrical-temporal property I call local impenetrability" [5]. It is concluded that this impenetrability is the ontological property of a neo-aether throughout and underlying the space-time manifold [5].

It is such impenetrability that enables and supports substantially the existence and efficaciousness of the forces through the projected non-uniform imprinting of the universals, via the universal constants in nature, on the space-time manifold. This would be occurring through an imprinting on an underlying manifold to that of space-time. This underlying and subsuming manifold, or neo-aether, is the ultra-physical domain of ultra-matter. It is through such supportive impenetrability that forces can arise to generate or regenerate, via a vortical process, adaptive, natural designs. In many of which, a vortical design also

becomes evident. In this regard, Paul Lieber noted that the helix is a geometrical-physical structure or adaptive design that in space-time reconciles constancy and change through its regeneration via a series of propagated and connected rotations, and it is a spiral design that is supported by impenetrability, its substantial dynamical features, and one that subsumes biochemistry.

The existence of the universal constants manifest or govern this process, which appears to have an underlying bearing on the generation and stability of a helix. The stability of the DNA intertwining helices might very well play an underlying and contributing role in stabilizing the sequences of purine and pyrimidine bases composing the DNA code and joining the two helices. And conversely, these complementing or completing base sequences through their cohesion, via hydrogen bonding, would stabilize the double helix and the codes themselves. Most probably, contributing to this stabilization of the DNA double-helix and its interior code is the ratio of the angstrom distance of a complete turn of the DNA double-helix (molecule) to its diameter in angstroms, which is 1.618 or 34A/21A or Φ [25]. The coiling of the DNA double-helix itself, as would occur during the generation of heterochromatin in development, might reflect a higher-ordered vortical process, which would be a stabilization process or dynamic during and at the close of morphogenesis in plants and animals [2].

And in this regard, the stabilizing-manifesting, regenerative-defining biological constant, 1.618, would appear to have become manifested through DNA's structure and form, and perhaps, during its higher-ordered vorticalization. Such a stable structure or form may also reflect a universal correspondence in nature through Φ. Nevertheless, it was proposed years ago that physical distortions of a bacterial chromosome, which is a DNA double-helix, could generate a global instability of such, leading to an observed hypermutation in bacteria, discovered by the author [19]. Hypermutation, it was conjectured, was a means to re-establish genome stability.

8. CONCLUSION: THE UNIVERSAL CONSTANTS: THEIR RELEVANCE TO BIOLOGY AND THEIR ACTIVE MANIFESTATION IN A BIOLOGICAL UNIVERSE

PART I.

From a new, feasible perspective, the physical, dimensional universal constants, and their dimensionless biological parameters, mark and reflect, and perhaps map, into our reality a deeper substantial dynamical reality, a ultra-physical, process reality, made up of immutable universals or templates in an ultra-matter. They appear to creatively mark or represent the generative, a stabilizing pattern, via various forces, involved in the emergence of our spatial-temporal domains; to which, our experimental procedures are bound. This would be a pattern with variations, marked by the universal constants, arsing dynamically through non-uniformity from such a ultra-physical reality There would be instantaneous dynamical connections, realized universally as forces, between this ultra-physical domain and our spatial-temporal domain, which are complementary to one another.

The emergence of this dynamic pattern from a ultra-physical reality into a spatial-temporal reality would enable a trans-scalar, evolutionary situation. Specifically, this situation would be an evolutionary, self-similar, corresponding dynamical or vortically generative, intersectional processes throughout the universe, ensuing in corresponding, connected, and derivative morphologies across different scales. This would suggest a type of morphogenic or biological determinacy emerging throughout the universe, and hence a type of experimental certainty, which would be transcalar, though bounded at our current stage of cognitive evolution. Currently, these instantaneous dynamical connections or constraints, their operations, cannot be controlled by us; and thus, from the standpoint of our current experimental capabilities, the operation of such constraints or connections would represent indeterminacy. Though, their involvement in structuring the dynamical processes of correspondence would reflect their universal determinacy in that regard.

Across various scales, these processes involve the reduction of ever generating dynamical non-uniformity through the generation and regeneration of dynamical uniformity or completion within non-uniformity, most likely through

vorticity, and in so doing, creating greater stability and coherence within and between natural designs. Living organisms, such as plants *in vitro* and *in vivo*, appear to manifest this greatly, and, through their evolution *in vivo*, they will do so progressively and coherently. By increasing our understanding of this process through our own cognitive evolution, we shall progressively obtain better insights into the nature of biological organisms and the role forces play in such. This would appear inevitable if certain evolutionary processes, structured through the constants, prevail. These evolutionary processes address the non-uniformities in nature, and it is these non-uniformities that manifest the forces and their vortical, self-similar dynamics or patterns towards adaptive completion.

> The process of reducing the [dynamical] non-uniformities in nature's space-time manifold [and thereby increasing the dynamical uniformity in non-uniformity in such] is here envisaged to be the ultimate aspect of all adaptive phenomena in nature. Evolution becomes then a word labeling this universal adaptive process. An aspect of evolution, which is both essential and universal, is force, and its nature we evidently do not grasp more in physics than in biology [5].

"Through the study of force in biology, [and the connected manifestation of constancy through such], the underlying unity and pattern of the diverse forces in the universe may be revealed" [6]. And thereby, a far better understanding of the specific, patterned, intricate, unifying, and sustaining dynamics involved in living organisms could also be achieved. And in so doing, will come to pass a much better insight into the meaning of the sustaining living state through dynamic, creative regeneration. This would be its morphogenesis and evolutionary processes, towards increasing dynamic completion and stability throughout all scales. And hence, a transcalar, evolutionary adaptation or accommodation would come to be.

The theme or unifying perspective as illustrated in this article through specifics, from the biological, physical, and geometrical domains, has a fair degree of feasibility. Yet, it is appreciated that such a theme would require a better, more complete foundation. Some of this can be provided by [6]. Towards a better foundation would be to develop, through investigation, a much better understanding of how the dimensional universal constants interconnect or integrate with one another, and what picture and meaning ensues. Especially from the perspective of the existence of a dimensionless biological constant, this would be the numbers of such represented in a dimensional physical constant,

the modifying integers involved and their significance pertaining to the constant, and the significance of exponential powers of the constant.

What does the number of biological constants occurring in a physical constant mean physically? What do the integers, such as 3 and 4, appearing with Φ through the factoring of some of the physical constants, represent? What do the various exponential powers of the biological constant define or represent physically? Do they represent higher orders of vortical, intersectional regenerations and the emergence of quanta through such regenerations? How are these higher orders necessary for stability or completion? These are questions, among related questions, which can be further investigated in the context of the theme.

In view of this, the theme presented in this article becomes highly heuristic as far as the questions it raises. And thereby, it should be seriously considered for further investigation and development, and consequently, it could be of significant value for the future practice of science. Hence, it may be beneficially practical in the long term, where a study of biological processes and their inner constants could give further insights into physical processes, and lead to an effective, more complete perspective on the universe. In this context, such a theme has value and would be justified, and thereby its exposure.

PART II.

This article and its theme began with a reference to morphogenesis in plants and the probable role adhesive and cohesive forces can play in such. As pointed out, adhesive and cohesive forces could also be involved in the stabilization of development. Adhesive and cohesive forces would, as illustrated, reflect a general process of forces operating through all phenomena. This would be a process of forces, in critical degrees, enabling the generation of stability and coherency across different scales of nature. This creates accommodation within nature. The existence of the dimensional universal constants of physics reflect, manifest and characterize such a universal drive towards increasing stabilization through increasing dynamical completion. These constants not only represent the sustenance of constancy in nature through forces, these constants also represent the guidance of the constraining forces towards the state of increasing stability and completion in nature. And in so doing, what their existence represents enables nature to have morphogenic and evolutionary features on all scales. In

effect, the universe is biological in all its manifestations, including mind and a universal, evolutionary experimentation.

An important geometrically guiding or defining component of and uniting many if not all of the universal, dimensional constants is a dimensionless biological constant, which is equal to 1.618 or to its reciprocal. This would be an important feature of a biological universe. This constant reflects or characterizes a rate of vortical generation or regeneration over 90 degrees. This vortical or spiral regeneration occurs, it is indicated, through all levels or scales of evolving organization in nature, giving it coherence, and it enables various morphological features or phenomena of nature, biological and "physical," to have universal, accommodating correspondence with one another in terms of dynamic morphology and stability. This might suggest a type of universal entanglement through different scales, which is known to occur at the sub-atomic level [20, 21].

It is conjectured that the seat of such vortical regeneration is a substratum of reality that is an ultra-matter through which are embedded universals. It is these embedded universals that make such an ultra-matter non-uniform and hydrodynamic, giving or projecting a generative, morphogenic reality of intersecting vortices within vortices in a space-time field through all scales. Through such intersections, representing discontinuities, would vortical quanta arise at different scales of reality. The constant quantum of action, represented by Planck's constant, and containing the biological constant, would be the smallest of such. And these quanta, including protons, appear to have vortical features. By means of his research and analysis, the physicist E. Lerner concludes that reality consists of a type of primal fluid that gives rise to vortices of structure from the quantum level through to the cosmological level [22]. He points outs that the Russian physicist, Lev Landau, had a similar view in the 1940s, and that persons are developing a vortical model of the electron. And the behavior of charged particles, such as electrons, in a magnetic force field, under particular conditions, might suggest the vortical fluidity of that field and of the electrons, and the manifestation of Φ through such fluidity.

If reality does appear to have such an encompassing, regenerative, vortical, self-similar morphology through different space-time scales, which could be a drive to adaptive stabilization through completion across different scales, then what the dimensionless biological constant stands for or geometrically manifests

can be concluded as being quite feasible and applicable. The stable, spiral arrangement of the chemical elements may also reflect this manifestation as would the spiral or helical arrangements of atoms within crystals. The DNA double-helix has been considered as a type of complex crystal. As we have seen, DNA manifests in its molecular architecture the golden ratio or Φ, which might reflect or manifest its stabilization. By extension or implication, Φ would reflect the stabilization of biological inheritance, and more generally, the inheritance of stability through self-similar, vortical regeneration into scales of space-time, which would underlie universal correspondence, and would manifest determinacy.

With respect to these stabilizing, dynamic patterns within physical and chemical situations, it should be no surprise that this biological, dimensionless constant is present within many if not all of the universal physical constants and unifies them. The feasibility of this constant's existence would be heuristic as far as initiating investigations along new avenues. "Thus, the golden ratio, which characterizes the fractal structure of nature, also appears in the geodesic structure of black holes...In this way, when we find the golden ratio in the geodesic structure of black holes, it gives us the future possibility of studying gravitation with fractal geometry, the geometry of nature" [10].

This might provide illumination on what has been considered as quantum gravity at the micro-scale, especially if the different types of forces are united, such as electrical and gravitational, in a Φ relationship in quanta of gravitation through intersectional guiding generations. Such intersectional generations of discontinuities could give rise to foci of vortices of quantum gravity, a microcosm of morphogenesis. It is predicted that such a relation will be found. An example of Φ's application is in fact found at that scale. The Planck length, a dimensional constant which applies to the micro-scale, also considered as the quantum of length, and which seemingly involves a proposed quantum gravity is 1.616×10^{-35} meter or $\Phi \times 10^{-35}$ meter. Note that the value of 1.616 is virtually identical to 1.618 or Φ.

In the field equations of general relativity, a constant mathematical component is clearly displayed, namely 8π. This equals $(\Phi\pi)^2$. This might suggest that the space-time curvatures of the universe, and their intersections on various scales, which would manifest the various forces on different scales, have a

constant, regenerative vortical parameter marked by Φ and π. The spiral arrangement of the chemical elements may, in a discontinuous manner, reflect these space-time curvatures and the manner in which the curvatures might have defined its spiral emergence. In effect, the various self-similar, dynamic organizations or designs or derivative morphologies involving mass, through different scales, might have been enabled by a constant, vortical regenerative parameter or projective process from an underlying domain, a process, itself morphogenic, defined or reflected by Φ and π.

It is predicted that through the golden ratio, most if not all of the various forces in nature will be shown to be united in a self-similar, vortically dynamic, perhaps involving other dimensions, in so doing, completing a universal morphogenesis. Such a process of unification would manifest the golden ratio through all scales and discovered dimensions. Even in view of the apparent pervasiveness of the constant, golden ratio in natural processes, it is appreciated that some vortical processes in nature could also feature constant rates of generation or regeneration other than the golden ratio. And that these could represent, or be represented by, other dimensionless biological constants, which could compose other types of physical dimensional constants, yet to be discovered.

It is further predicted that these other types of dimensionless biological constants will be found in physics, and that these will also be associated with various vortical patterns of generation, and will also manifest determinacy. Even if one has reservations about the existence and role of such constants, is it not nevertheless productive for science and historical epistemology to at least consider the feasibility of their presence. Might one finally ask: Would the vortical development of a rose provide some insight into the dynamical behavior at the sub-atomic level and reveal an underlying regenerative constancy?

9. POSTSCRIPT: EVOLVING EXPERIMENTATION, DETERMINACY AND CONSTANCY: AN EVOLVING BIOLOGICAL EMPIRICISM IN AN EVOLVING BIOLOGICAL UNIVERSE

The presentation in this article would appear to have connoted the Aristotelian view of final causes or purpose in evolutionary processes and living organisms. This could be considered as not being in accord with the scientific method. In

unpublished manuscripts, Paul Lieber realized that science, as it is practiced, is at present currently and unknowingly bonded to and limited by the conventional mode of experimentation. And that there exist in nature, and that nature works in, "other complementary experimental modes in which causation, intention and purpose, achieved by substantial dynamic co-adaptation and evolution, are realized and exercised." Science, a human process, does rest on the principle of objectivity, or more basically, on the presence in nature of absolutely immutable or invariant features, that is, constancy. This situation "does not exhaust the information content of natural law, and/or complete scientific theory." In this regard, "the principle of objectivity does not deny purpose in nature."

Through these complementary modes of experimentation, sustained via forces, constancy in nature, its immutable features, becomes more and more manifest and apparent as does a contingent certainty. And ultimately such constancy is the basis of or enables a deeper, governing objectivity in nature and an increasing experimental- reproducibility, and progressively less uncertainty. It would be a progressive stabilization of scientific practice. A hierarchy of decreasing indeterminacy would become apparent. It is through this increasing type of objectivity in nature, a growing stability and accommodation, and one's increasing, encompassing access to such, that an increasingly substantial, non-contradictory, and completed view of the living organism, evolutionary processes, and nature will arise, and yes, this shall be accomplished, teleonomically.

Such experimentation would itself be a creative accommodation and a co-adaptation process, a biological process, involving the dynamical interactions and a bringing together of completing dynamical features of existence, a creative, generative dynamic. Thereby, such experimentation, and hence science itself, would reflect and correspond at all scales to the evolutionary processes of the universe. And in so doing, this would enable a growing reflection of an objective, dynamic universe and humanity's increasing apprehension of it, and of the underlying universal templates as represented by the universal constants.

Such immutable templates, the ultimate objectivity and constants, should become more manifest through our evolving, co-adaptive experimentation in synchrony with the biological process. These templates might be considered as universal codes, which are most manifested in living organisms, possibly through their development, and probably most accessible through them, such as the very human mind, which has created the computer and its codes, a variation of

objectivity, that appear to be universally applicable and sustainable. Ultimately, this leads to completion, and such is most beneficially adaptive at all levels of organization, including the social.

In fact, a differentiation code becomes manifest in salamander development, where particular waves of mechanical force are involved [23]. One wonders whether such a code could involve deeper universal codes, applicable to development in general, in which force configurations are significantly involved. In this regard, the author, in analyzing the data presented in the article [23], found that the ratio of contraction waves to expansion waves within stages of salamander development before final developments is equivalent to the square of the value of the dimensionless biological constant, namely Φ^2. As noted, the author had conjectured that this constant, 1.618, associated with vortical regeneration, could reflect universal codes or templates in nature [6, 7]. This would also be through an examination of the values of the dimensional physical constants as presented in [24].

Deciphering these codes, and the manner they are dynamically enforced or expressed through all scales of nature, would also provide a major, objective insight into nature. Such universal codes or templates would reflect and enable a universal, intrinsic, generative and creative principle that allows for corresponding existences and stable, developmental adaptation throughout all scales and orders. It would be a principle that would enable and enforce various manifestations of constancy within the universe. Through our evolution, this will become more and more a stable, hence objective, realization. And such would give substantiation to our evolving epistemology. Perhaps, biologists and physicists, and even sociologists, could approach their respective disciplines from this perspective. It is an endeavor certainly worth pursuing. If done, this could lead to a very constructive, adaptive paradigm shift. Throughout the evolution of human society, scientists, including social scientists, have striven to bring completion to their theories, a finally completed paradigm, an evolved unified perspective. Could not this be a reflection of nature's evolutionary drive to bring completion throughout itself, and thereby, humanity's?

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