

Y-Bias and Angularity: The Dynamics of Self-Organizing Criticality

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The quest of modern physics has been to develop a model which correctly describes the role and dynamics of the interactions by which Nature works at all scales. In order for the model which describes these interactions to be robust, it must not only accommodate phenomena which are known to occur and all rigorously documented phenomena, predict phenomena which are as-yet undiscovered, and allow for the inclusion of all rigorously observed, impeccably documented, accurately reported data derived from all sources. To be adequate, any universally applicable physical model must also accommodate the contemporaneous interaction between Descartes' 'physical stuff' and 'spirit stuff' with equal cogency and grace. The standard physical model fails to rise to this standard. Experimental results provided by the most powerful microscopes, largest telescopes, fastest linear accelerators and other advanced devices, demonstrate that there is an underlying order in the cosmos which has not yet been understood or articulated. The shortcomings of the Standard Model are ameliorated by the application of the rules of Self-Organizing Criticality in complex, open systems [SOC][1] as characterized by the Fibonacci Series of numbers when integrated with the dynamics described as Y-Bias and Angularity.[2]

1. Introduction

Every useful model is based on a set of assumptions. To the extent that the underlying assumptions have been properly validated, the conclusions extrapolated from them can be relied on to accurately describe any set of related properties, functions, or behaviors observed thereafter by others. Moreover, valid assumptions make it possible to predict interactions and outcomes not previously unobserved or reported. The list of assumptions which have not been validated, reported, or repeated experimentally, but which are nevertheless accepted as primary underpinnings for the standard physical model, is long and growing longer. Among the most egregious of these presumptions we find the following:

- Invariance of the Alpha Constant
- The speed of light as the upper limit to transport velocities
- Planck's Constant as the primary limit of time and spatial dimensions
- Four Primary Field Effects regarded as mutually exclusive, a priori, and exclusionary
- The Big Bang Cosmological Model of the Universe
- Black Holes
- Dark Energy & Dark Matter

The proximate result of science's compulsory reliance on these and other equally flawed notions is that an equally long list of fundamental physical attributes observed in the natural world remains completely unexplained. Chief among these are the primary nature of such things as

- Matter
- Mass, Energy
- Magnetism
- Gravitational field effects
- Superluminal velocities
- Simultaneity, defined as non-local effects at a distance

Since Hubble observed the red shift in photons originating from far distant astronomical bodies, the standard physical model has come to rely exclusively on the validity of the theory of cosmological origins [referred to as the Big Bang Theory] as the basis for all subordinate considerations. The Big Bang model holds, among other things, that everything in the observable universe was created at some far distant moment in the past as the result of a single inexplicable instantaneous singularity. Defenders of the model insist, and the standard model proclaims, that four primary field effects pre-dated the Big Bang event and caused the eventual outcome to dynamically evolve over some indefinite period of time to become the observable Cosmos.

Indeed, it is a dictum of the Big Bang model that the four primary *a priori* field effects which controlled its evolution are the only naturally occurring field effects that operate universally in the cosmos. An explanation of how and why this is so has yet to be satisfactorily articulated.

Accordingly, what Science has failed to recognize is that in point of fact, the Big Bang model is not a fact at all. It is an idea. It is an idea which cannot be reasonably defended by any rational extension of scientific logic or evidence. Therefore, the assumptions which have been invented by the model's proponents to defend it violate the most fundamental precepts of Science and the scientific method. Consequently, Science now finds itself unable to come to grips with a whole new world of discoveries which hold the keys to understanding how Nature works at all scales. As a result, the list of experimentally verified, impeccably reported, and repeatedly demonstrated phenomena not accommodated by the standard physical model is also getting longer with each passing day.

2. Not-Accommodated Phenomena

In contrast to the simple, elegant, uniformly applicable and universally observed set of phenomena defined by Bak/Ayers, the architecture of the Standard Model fails to accommodate a

number of important recent discoveries. Additionally, theoretical models recently developed to describe the dynamics which govern scalar interactions have thus far failed to accommodate rigorously documented phenomenological anomalies such as non-local effects at a distance [3], scalar non-local field effects [4], inertial mass reduction in non-linear gyroscopic oscillations [5], consciousness interactions with primary particle and photon behaviors and beams of laser light [6], delayed-choice experiments in astrophysical observations [7], super-luminal data transport rates [8], non-local field effect persistence [9], overunity plasma discharge effects [10], the energy ΔE generated by the separation and recombination of Hydrogen atoms in a vacuum [11], and super-symmetry occurring at primary scales of interaction [12]. Recent astronomical observations such as the behaviors of black holes, temperatures in excess of 100 million degrees F at the core of newly formed stars and galaxies, observed variations in the speed of light, and other naturally occurring phenomena not accommodated by the Standard Model, are both accommodated and predicted by the new model described here.

3. Standard Physical Model

R. Santilli, in his widely recognized and published work, has described the Standard Model as follows [13]:

In the 1950s and '60s scientists faced a bewildering array of particles coming from particle accelerators as they pushed to ever higher energies. Order was offered in the 1960s when several scientists proposed what is now called the Standard Model.

In it, six types of Quark (and corresponding anti-Quark) are the building blocks for heavy particles. Mesons (middleweight particles) are made of two Quarks (or antiquarks). Baryons (heavyweights, including Protons and Neutrons in the nuclei of atoms) are made of three Quarks (or antiquarks).

Electrons, described as buzzing in clouds around the nucleus, are in a separate category called Leptons (lightweights). There are only six Leptons: Electrons, muons, and taus, plus three corresponding neutrinos. Leptons are their own fundamental particles. Like Quarks, Leptons are believed to be fundamental particles with no underlying structure.

Quarks	u up	c charm	t top	Force carriers
	d down	s strange	b bottom	
Leptons	neutrinos			W boson
	ν_e	ν_μ	ν_τ	
	e electron	μ muon	τ tau	

Fig. 1. Caption

One of the fundamental questions still unanswered by the Standard Model is compelling, when stated as follows:

If Einstein's GTR [General Theory of Relativity] is admitted as the defining standard for all field effects which operate in the cosmos, and given that the relativistic attributes of C [the speed of light] constitute an absolute upper limit to the rate of information transport velocities in the 4-dimensional universe, by what combination of primary interactions is the cosmos able to operate in real-time, across 15- 20 Billion light years, as an SOC system?

This question, in turn, gives rise to a discussion of other fundamental issues, including (1) the nature of the set of properties currently referred to as mass, magnetism and gravitational forces, as reflected in the Alpha Constant [14]; (2) the nature and dynamics of the class of phenomena currently referred to as "primary field effects;" and (3) the incompatible operative dynamics encompassed by current formulations of electromagnetism [as reformulated by Myron Evans, Lawrence Crowell et al] [15], quantum expressions of the gravitational forces and the laws of thermodynamics [as clarified by M. Melehey] [16], and the reformulation of Hadronic Mechanics [as produced by Santilli et al].

Intrinsic to this set of issues are the ancillary issues related to the role and nature of (1) hadronic spinors [Cartesian torsion as defined by E. Cartan and R. Santilli's reformulated model of Hadronic mechanics] [17], (2) non-local scalar field effects [as experimentally verified by N. Gisin, A. Aspect, J.A. Wheeler, V. Poppo and others] [18], and (3) the coupling of consciousness with hadronic interactions, photonic effects, local and non-local field effects and related phenomena [as experimentally verified by Drexler University, Eyring Research Institute, Aluminum Research Center, and others [19], and Dr. Dean Radin, UNLV] [20].

One fundamental shortcoming of the Standard Model illustrates how severely crippled this model has become. The Standard Model of physics takes for granted the often-stated "fact" that while a fixed primary charge produces a set of resultant fields and field effects, which are radiated directionally, in terms of varying weighted vector velocities, time and spin polarization, angular momentum and waveforms [as measured in Fermi units of 10^{-13} cm], usually in the form of photons, as a consequence of its interaction with surrounding charges and its locale, the dynamics of its interactions have not yet been adequately explained. Further, the Standard Model does not illuminate the paradox that while the charge ensemble produces energy as a result of its interactions with other charge ensembles or field effects, experimental evidence demonstrates that this interaction takes place in spite of the fact that no observable energy is input to the source charge.

Again, in Bearden we find,

Experiment establishes there is no observable energy input to the source charge. Yet charges continuously pour out energy and establish all EM [electromagnetic] fields, potentials, and their energy quanta. Classical EM and electrical engineering models accept that the associated charges are somehow the sources of all EM fields, potentials, and their energy output. But the models assume that the charges create those fields and potentials and their energy, from nothing at all, because they assume there is no dynamic energy input to the charge. Thus, present electrical power engineering uses a seriously flawed EM model that assumes total violation of the conservation of energy law. [21]

Second, Bell's Theorem predicts non-local effects at a distance [22]. N. Gisin's 1997 experimental verification of Bell's Theorem at CERN demonstrates conclusively that non-locality at a distance is an intrinsic attribute of Electron-Positron pairs [23]. Nevertheless, non-locality and well documented anomalies involving non-local field effects, such as those referred to in the literature as Poponin's Phantom DNA Effect [24], are prohibited by the current model of physics as universally occurring, natural scalar phenomena.

Third, the current notion, embodied in the GTR and Einstein, Podolski, Rosen [EPR] formulation of gravitational effects, is that gravitational force, electromagnetic force, the strong and weak nuclear forces are primary, pre-existing and mutually exclusive [25]. Y-Bias/Angularity Theory suggests that the traditional field effects identified by the Standard Model are neither primary nor mutually exclusive [26]. Rather, when viewed in the context of Y-Bias interactions, all local-linear [L²] and nonlocal/nonlinear [N²L²] field effects are found to be derivatives of the same set of primary scale Y-Bias interactions occurring at the Zero Point, as defined and governed by Bak's autopoietic rules of self-organizing criticality, which constitutes a unifying extension of Dissipative Structures as defined by I. Stengers and I. Prigogine.

Fourth, while the work of Bak et al rigorously validates the operative dynamics of autopoietic interactions in SOC systems, physics as a convention and Science as an institution have thus far failed to integrate this seminal information into the fabric of the Standard Model. The absence of a cogent cosmology, based on SOC rules, renders the Standard Model both incomplete and fundamentally flawed because it cannot accommodate any of the naturally-occurring non-local effects at a distance phenomena which have been observed, documented, rigorously verified and consistently reported for more than 100 years, and which are the fundamental constituent attributes of the fabric of the cosmos.

Fifth, the Second Postulate of the STR [Special Theory of Relativity] sets an arbitrary upper limit to the relative velocity of both physical and virtual photons operating in L⁴. Nevertheless, rigorously disciplined experimental evidence demonstrates that semantic information [in both digital and analog forms] can be propagated and received at least 10⁹ C [27] [this refers to capital C as a relativistic value, as opposed to 'c', which is accepted as an absolute value in current formulations of field forces] [28], without attenuation by any known interposed materials or distance.

Sixth, the General Theory of Relativity [GTR] and the exceptions provided in the 2nd Postulate of the Special Theory [STR], which describe quantized radiation of virtual photons, are inconsistent with a rigorous analysis of photographic imaging conducted during the past decade by the Hubble Space Telescope. According to the GTR [29], Hubble should not be able to snap sharply focused pictures of far distant objects. Nevertheless, Hubble's images are crisp and sharply focused, regardless of the absolute distance to the light-emitting source. According to Ragazzoni et al, whose team studied Hubble pictures of a galaxy more than 5 billion light-years away and, separately, an exploding star 42 million light-years distant,

When light arrives from a distant object, some parts of the light's wave should be retarded with respect to others, because each would take slightly different paths through the "foam." [ref:

'quantum foam' as found in Superstring and M Theory]. Light will appear to come from positions around the actual source, causing a blur. [30]

"You don't see a universe that is blurred," he said. "If you take any Hubble Space Telescope Deep Field image you see sharp images, which is enough to tell us that the light has not been distorted or perturbed by fluctuations in space-time from the source to the observer."

According to GTR, light is said to move in very small but measurable quanta. Time is presumed to move in correspondingly miniscule quantum bits. The bits are assumed to comport with Einstein's theory of general relativity, which describes physics at the large scale of the universe. In the final analysis, Einstein asserted that time, gravity and the fabric of space are all different manifestations of the same underlying phenomenon.

However, in recent years theorists and rigorously verified experimental evidence have shown that a pair of quanta, consisting of a virtual photon of the Planck length and a similarly miniscule packet of Planck time, should be the smallest measurable physical components in the cosmos. Below these thresholds things should become undifferentiated [e.g., at the scale of the Physical Vacuum]. If light's travel is quantized as described in GTR, it could not, according to current theory, be variable in units below the Planck limit.

"If time doesn't become 'fuzzy' beneath a Planck interval, this discovery will present problems to several astrophysical and cosmological models, including the Big Bang model of the universe." [31].

One challenge for proponents of the Standard Model, if the results reported by Lieu and Ragazzoni are on track, is that the instant of the Big Bang would have involved an infinitely hot and dense condition, which is specifically prohibited by the Standard Model and current theory. This anomaly strongly suggests that Time, as a quantized element of L⁴, and as predicted by Y-Bias/Angularity Theory, does not exist at the Zero Point. This suggests, in turn, that Time, as a mutually distinct dimension demonstrating its own energy density, is therefore a product of primary scalar interactions occurring at the Zero Point, which serve to convert virtual charge ensembles with positive entropy to actual charge ensembles with dualistic properties demonstrating dissipative entropy.

Since this element of the new model is supported by rigorously validated mathematical expressions and verified by observable phenomena, the nature of the cosmos, including all its attributes in L⁴, must be fundamentally different than that which is described by the GTR and the Standard Model.

4. Field Effects - Flaws and Myths

The current notion, embodied in the GTR and EPR formulation of gravitational effects, is that gravitational force, electromagnetic force, and the strong and weak nuclear forces are the only forces in operation in the cosmos. Further, it is held that these field effects are primary, pre-existent to any interactions at any scale, mutually exclusive and universally exclusionary [32]. This dictum requires that the four 'primary' field effects must be invariant; that is, wherever they are observed, they must operate with absolute linear consistency at all scales.

The literature is now replete with impeccably documented evidence which demonstrates that none of these fields are invariant at any scale. Further, experimental evidence currently demonstrates that each of these field effects can be arbitrarily mitigated by the application of suitably engineered experimental macroscopic techniques which are the product of their mutual interactions.

Rigorously disciplined experimental reports demonstrate, for example, that the speed of light in a local and universal sense is neither invariant nor restricted to either upper or lower limits [33]; that gravitational force can be mitigated in a targeted locale [34]; that information transport velocities can operate in excess of 10^9 times c under controlled conditions [35]; and that the disciplined exercise of human choice exerts a repeatable, demonstrable, quantifiable effect on coherent light, matter, energy and the four 'primary' field effects [36].

While the phenomenological evidence is no longer arguable, no cogent explanation has yet been supplied in the context of the Standard Model to describe these interactions in a way which is consistent, experimentally verifiable or universally applicable. The authors posit that if the field effects described in the Standard Model are primary, no manipulation of a product of their interactions or effects at any scale can have the effect of mitigating them. Mitigations of all known field effects at all scales are now shown to comprise a ubiquitous set of localized exceptions to the generally accepted rules. This insight demands that the four 'primary' field effects be recognized as derivative effects which are manifestations of [and therefore subject to the dynamics of] an underlying set of quantifiable primary causes.

Y-Bias Theory holds that the traditional primary field effects are neither primary nor mutually exclusive [37]. Rather, the local-linear and nonlocal/nonlinear [referred to hereafter as L^2/N^2L^2] field effects observed, verified, reported and described in the literature are all derivatives of the same primary Y-Bias interactions occurring at the Zero Point, governed by SOC dynamical rules, and carried from the most finite to the largest scales as primary, intrinsic, self-referential, and autopoietic attributes of Nature itself.

5. A New Model of Physical Interactions

The authors provide a simple, elegant model of scalar interactions which accommodates heretofore not accommodated phenomena, predicts new interactions and remediates other cosmological deficiencies in the standard physical model by describing how the fundamental processes of *Y-Bias Interactions* [38] originating in the Physical Vacuum operate with optimal concomitant *Angularity* in their interactions to operationalize the autopoietic processes found in *Self-Organizing Criticality* [SOC], as described by Bak et al [39]. These interactions combine to produce the cosmological space-time continuum described by Minkowski as 4-space [L^4], defined in terms of time, matter, energy and Local-Linear/Non-Local, Non-Linear [L^2/N^2L^2] field effects.

The Y-Bias model of scalar interactions posits a regularized set of dynamic processes which operate from the timeless, infinite, holographic expanse of the physical vacuum to the infinite vastness of the universe as a perpetual cycle of self-organization and catastrophic annihilation at all scales. The Y-Bias model pro-

poses that everything in the cosmos is comprised of information. When the rigors defined by self-organizing criticality are imposed on what we think we know about information, a completely dynamic process can be constructed which operates with absolute regularity from top to bottom, from the inside out.

The Y-Bias model operates within the construct of ten (10) quantized scales of complexity. These are defined as:

1. Physical Vacuum
2. Virtual Ensembles
3. q-bits [sub-quarks]
4. Quarks
5. Hadrons & Leptons
6. Atoms
7. Molecules
8. Local Complex Open Systems
9. Solar Systems
10. Galactic Systems

At each scale the laws of self-organizing criticality operate with invariant regularity. The set of rules which apply to the organization and dynamic interactions in complex, open systems to create and disaggregate time, mass, matter, local and non-local field effects, light and energy. The primary factors are defined as:

1. Punctuated Equilibrium
2. Fractal Geometries
3. $1/f$ Noise Thresholds
4. Logarithmic Power Laws
5. Fibonacci Series of Numbers

6. Complex, Open Self-Organizing Systems [SOC]

For the purposes of this discussion, a complex, open, self-organizing system is defined as one which demonstrates the characteristics of the condition known as criticality. For purposes of illustration, at the grandest of scales, the Milky Way Galaxy [like all galaxies found in the cosmos] is a complex, open, self-organizing system [40].



Fig. 2. Hubble/NASA example of Celestial Organization

At a finer scale, the same is true of our own solar system. In every sense, it demonstrates all the characteristics, attributes and behaviors associated with self-organizing systems [41]. So does our planet. Taken by itself as a single comprehensive unit, the

Earth and its sub-systems all demonstrate the attributes of self-organizing criticality at every scale, from the release of virtual photons produced by primary energetic interactions to the Earth's participation as a member of the solar system set [42]. All these systems operate, as Capra [43] has rigorously reported, in an integrated, indivisible aggregation of inextricably inter-related constituents which, in the final analysis, comprise a single overall SOC system [44].

7. Self-Organizing Criticality

Criticality is mathematically defined as the state of highest efficiency in a complex system [45]. At the point of criticality, catastrophic events happen in a big way, all at once, and not by gradual degrees. This is as true of rush hour traffic jams as it is of mass extinctions and major weather events. When we understand this aspect of complex systems, we also begin to understand something fundamental about the way Nature works. When it is understood that this set of rules operates at all scales, it then becomes possible to develop a model which explains the observable phenomena which are not accommodated by the Standard Model. It also becomes possible to predict the existence of phenomena not yet discovered, which can be logically presumed to operate according to these rules at larger and smaller scales than previously imagined.

The structure of the cosmos is assumed to be universally coherent in terms of SOC rules. These rules provide that as undifferentiated "virtual" information originating in the Physical Vacuum [and emerging via the Zero Point] coalesces with other virtual ensembles to create fundamental pairings [which demonstrate duality, polarity, spin and time domain properties], the process of coalescence adheres to five primary conditions. According to Bak, all five conditions operate simultaneously and ubiquitously at all scales [46].

8. The Role of Criticality

Bak's investigation of SOC system dynamics began as an attempt to model the self-organizing behaviors associated with catastrophic avalanche events. The definitive experiment viewed this set of dynamics as embodied in a randomly organized pile of uniform grains of sand. As Bak and his team constructed each sand pile, they realized that there comes a time when the sand pile can no longer be characterized as a stack of single, unrelated grains. As the mound of sand reaches the point of criticality [that point at which the quantum $1/f$ threshold has been breached and the power laws become operative], the sand pile becomes a single, integrated, self-organizing system.

As soon as this happens, it is no longer possible to predict the magnitude, location or frequency of any single avalanche event within the system. As the experimental evidence shows, even if we simultaneously know everything there is to know about every single grain of sand comprising the pile, the nature of open, complex and self-organizing SOC systems is such that we cannot improve the consistency, accuracy or reliability of our predictions regarding its behaviors in any locale. In SOC systems as they operate in Nature, there is no linear, 1-to-1 relationship between events occurring in the past and those which are anticipated in the future.

We can predict only what the power laws permit. The importance of this insight cannot be overstated. It means, among other things, that in spite of all the best technologies and instrumentation we will ever devise, we will never, under any circumstances, be able to reliably predict the magnitude, location or timing of any events which occur as part of any complex, open SOC system [47]. This includes earthquakes [48], solar flares, stock market behaviors, mass extinctions, meteor strikes, weather, geologic events or the behaviors of human interactions such as the Internet. If our way of thinking about the world we live is modified to comport with the way the cosmos really works, instead of the way the world is described by the Standard Model, our approach to exploring the mysteries of the cosmos must be altered in ways that are still largely unimaginable.

9. Simple, Elegant Rules

According to the experimental data developed by Bak et al, it is evident that open, complex, self-organizing SOC systems simultaneously and universally demonstrate all five of the following attributes:

9.1. Punctuated Equilibrium

Criticality is defined as the point in SOC system evolution at which an observable event occurs. Between each event or "avalanche" there are relative periods of apparent stasis which are punctuated from time to time by other "avalanches" of various magnitudes. These avalanches can be literal, as in the case of Bak's sand pile [or the catastrophic rush of a field of snow down a slope], or they can take the form of mass extinctions, the rises and falls of the stock markets, the occurrence of solar flares, earthquakes, tornados, hurricanes or floods, wars, the evolutionary cycles of the Internet, the evolution of languages, etc. The phenomenon of punctuated equilibrium is an intrinsic dynamic comprising the quantum functions which have been observed to operate at all scales in Nature. In this view of SOC behaviors, the geological effects demonstrated by the Grand Canyon, for example, are the product of a series of catastrophic avalanche events rather than the gradual grinding down of geological strata by hydro-dynamic erosion over millions of years. The science of geology now confirms this to be a more accurate depiction of such geological events.

9.2. Power Laws

The relationship between the magnitudes, frequencies and locale of individual avalanches can be expressed in terms of a simple exponential equation. There are no singular explanations for large events - the same forces which cause the Dow Jones Industrial Average to rise 5 points on one day also caused the crashes of 1929, 1987 and the Dot.com crash of 1999. Wherever we find that a logarithmic relationship exists between a series of catastrophic events, which can be plotted on a set of X-Y coordinates as a straight line with a slope, we can be absolutely certain that the system which produced it is a self-organizing SOC system. The logarithmic relationship which characterizes the power laws governing SOC processes is primary to the formation of matter, energy, time and all the field forces which operate in the cosmos. All of Nature, at all scales, manifests uniform compliance with this rule.

9.3. Fractal Geometry

First expressed by Benoit Mandelbrot [49] of IBM, fractal geometry is a mathematical construct which illustrates that where a complex, open, self-organizing system exists anywhere in our space-time continuum, it is self-similar at all scales in Minkowski 4-space. Fractals are the natural record of the evolution of natural, open, complex, self-organizing systems of all kinds. In this context, Y-Bias/Angularity Theory holds that the "boundedness - unboundedness" attributes manifest by the aggregations of scalar components occurring at the Zero Point define the eventual form each event will become at each subsequent scale of organization. Boundedness, the conceptual construct reflected by the self-similarity which characterizes fractal geometry, occurs as the result of the interaction of scalar components beginning at the primary scale and extending throughout the micro and macrocosm. The formula which describes the fractal properties of SOC interactions is [50]:

$$Z \rightleftharpoons Z^2 + C \quad (1)$$

By its nature, fractal geometry serves to organize discrete quanta of information into aggregations which are either bounded [as Z] or unbounded [as $Z^2 + C$], in a way which preserves the primary data sets found at the Zero Point and thereafter throughout each quantum-defined scale of subsequent organization. The basic fractal formula suggests that SOC dynamics are self-referential, as shown by the function ' \rightleftharpoons ', which connotes interaction rather than equivalence. This is the primary function identified by Kafatos & Nadeau [51] which considers 'background reality-as-it-is' to be self-referential at all scales. This function is also the operative dynamic which drives the Implicate Order postulated by Bohm [52].

When a complex system evolves to a state of self-organizing criticality over any increment of time Δt , the physical record of its evolutionary history can only be described in terms which are fractal. The shape of a riverine delta, the variegated slopes of a mountain range, the shape of a coral reef, and the corrugated features of the human brain are all records of the evolution of self-organizing systems manifest in fractal form. It is because fractal geometry constitutes the natural expression of the evolution of SOC systems that analysts have been able to develop applications which efficiently identify non-fractal patterns found in the natural landscape.

9.4. 1/f Noise

In order for any observable event to occur within an SOC system, the interactions between individual components and field effects must exceed quantum-defined scalar "noise" [1/f] thresholds. For an aggregation of components at any scale to become self-organizing, the number of components, their aggregate properties, and the Y-Bias/Angularity effects they exert on each other must combine to breach the minimal noise thresholds. By definition, this set of interactive properties and dynamics demands that all such interactions must be accompanied by and combine to create a concomitant set of harmonic resonances, regardless of the scale at which they occur. The nature and importance of harmonic resonance in this regard is addressed under

the discussion about the Fibonacci Series of numbers and its relationship to Gravitational Forces.

10. Fibonacci Relationships

The Fibonacci numbers have been known since ancient times. These are not random numbers but, rather, are members of the following sequence:

$$1 \ 1 \ 2 \ 3 \ 5 \ 8 \ 13 \ 21 \ 34 \ 55 \ 89 \ 144 \ 233 \ 377 \ 610 \ 987 \ 1597 \ 2584 \ \dots \quad (2)$$

In this series each number is the sum of the previous two. The ratio of successive pairs tends to the so-called golden section (GS) = 1.618033989, with reciprocal $G = 0.618033989$, so that we have a resultant product mathematically defined as:

$$\frac{1}{G} = G + 1 \quad (3)$$

Fig. 3 represents the range of values from $N = 0$ to $N = 1000$, including the F numbers 377, 610 and 987, rescaled by dividing the vertical values by N , to show the multiple harmonics of the 'Golden Mean' more clearly. These are shown by blue horizontal lines. The short blue lines mark the two golden section (GS) points in each segment. If the length of a long blue line is taken as 1, then the three segments have lengths G^2 , G^3 and G respectively. G^2 and a G^3 add to G . In a vertically integrated view, the plot of these functions appears as follows:

Fig. 3. Caption

The values represented by the resultant function are

$$G = 0.618033989 \quad G^2 = 0.3819659 \quad G^3 = 0.2360678 \quad (4)$$

The bar-graph diagram derived from the same number set and values is rather like a one-dimensional fractal. Each element contains all the information contained in the entire expression

Fig. 4. Caption

When plotted as an X-Y graph, the X-axis spiral intersects the Y-Bias at the values shown as 1 2 5 13 [etc.] on the positive axis, and 0 1 3 8 etc on the negative axis. The oscillatory part crosses at 0 1 1 2 3 5 8 13 [etc.] on the positive axis. The resulting curve is the analogue of SOC structures found at virtually all scales, the magnitude and strength of which vary as a function of the extent to which the intersections approach the optimal angulature defined by the Fibonacci Series. This is not surprising, since the spiral of the curve demonstrates its logarithmic nature as it expands.

Fig. 5. Caption

The form and shape of this plot is precisely what Prigogine/Stenger's Dissipative Structures, Bak's SOC rules and Y-Bias/Angularity Theory describe. The fact that the relationships and attributes demonstrated across the scales of the cosmos demonstrate adherence to this same set of simple, elegant rules, suggests that our view of 'How Nature Works' must be substantially modified if we are to really understand its mysteries.

Planet	Mean distance in million	Relative mean distance
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	kilometers per NASA	where Mercury=1
Mercury	57.91	1.00000
Venus	108.21	1.86859
Earth	149.60	1.38250
Mars	227.92	1.52353
Ceres	413.79	1.81552
Jupiter	778.57	1.88154
Saturn	1,433.53	1.84123
Uranus	2,872.46	2.00377
Neptune	4,495.06	1.56488
Pluto	5,869.66	1.30580
Total		16.18736
Average		1.61874
Phi		1.61803
Degree of variance		(0.00043)

Table 1. Caption

When viewed in this perspective, the solar system of which earth is a member demonstrates rigorous compliance with this set of organizational rules. When viewed in the context of SOC system development, it is instructive to note that the relative distances of the planets from the sun demonstrate a vivid example of planetary compliance with SOC-mandated Fibonacci relationships. The solar system currently operates within a tolerance of 0.00043 degrees of variance from the ideal Fibonacci Series.

The average of the mean orbital distances of each successive planet in relation to the one before it approximates phi [53]. We sometimes forget about the asteroids when thinking of the planets in our solar system. Ceres, the largest asteroid, is nearly spherical, comprises over one-third the total mass of all the asteroids and is thus the best of these minor planets to represent the asteroid belt. (Insight on mean orbital distances contributed by Robert Bartlett.)

11. Einstein's Vector Magnetic Potentials

At this juncture we pose the seminal question:

“Assuming that the rules of SOC systems uniformly and universally apply to all interactions, what is the essential dynamic that defines the process?”

In the decade of the 1920’s, Einstein introduced the concept that only the vector magnetic potential has a physical reality in electrodynamics. He postulated that the electric and magnetic fields are merely conceptual constructs developed to accommodate the reciprocity observed in field interactions between charge ensembles. Most modern physicists still do not accept this assertion. This remains true, even though more recent experimental research [the Aharonov-Bohm experiment] conclusively demonstrates that the A field is real (the experiment shows that A can alter the quantum wave function) [even] when all other EM effects have been completely shielded out [54, 55].

Recent experimental research [e.g., the Aharonov-Bohm experiment] shows that the A field [the N²L² non-local/non-linear

field described by Kafatos and Bohm, as demonstrated by Gisin et al] is quite real. The seminal experiment shows that the A field can alter the quantum wave function [even] when all other EM effects have been completely shielded out [56].

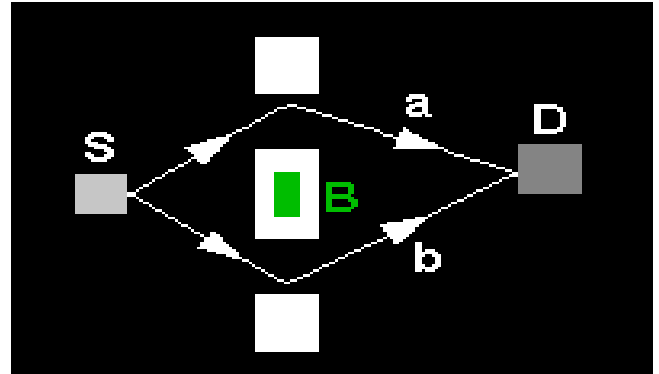


Fig. 6. Schematic Diagram of the Bohm-Aharonov experimental protocol.

The Aharonov-Bohm effect demonstrates that it is the electromagnetic potentials, rather than the electric and magnetic fields, which are [as Einstein correctly intuited] the fundamental quantities in quantum dynamics [57].

12. Conclusion

From our analysis of the data we have gathered, correlated and analyzed over the past 40 years, we believe the following conclusions about the world we live in and the universe which surrounds us are reasonable and supportable:

- The universe is not a clockwork mechanism at any scale.
- Nature operates according to a set of simple, elegant, universally applicable rules which are consistent at all scales, from the Zero Point to the infinite expanses of the cosmos. These rules include:
 1. Y-Bias effects,
 2. Angularity, and
 3. Self-organizing Criticality, as defined by
 - Power laws – logarithmic relationships between similar events
 - Punctuated equilibrium
 - 1/f Noise Thresholds [e.g., quantum dynamics]
 - Fractal Geometries
 - Fibonacci relationships
- There was no 'Big Bang' to mark the beginning of the universe. The universe is infinite, boundless and timeless in L⁴. If a seminal, universal phenomenon did occur 15-20 billion years ago, it was almost certainly one of a series of similar, recurring phenomena of its type which have also occurred over the eons in the past and will eventually happen again at every scale.
- The fundamental physical attributes upon which the standard physical model is based are not invariant at any scale, including:
 1. Speed of Light [C] and photons generally
 2. Mass
 3. Gravitational Force

4. Electromagnetic Forces
 5. Nuclear Forces
 6. Time
- No field forces, including mass or time, exist prior to the local organization of L^4 at the Zero Point. Rather, all field forces, mass and time are the products of Zero Point scalar interactions of increasing complexity, which are occurring everywhere, all the time, in every address encompassed by the cosmos.
 - Non-local/non-linear field effects are complementary and operate everywhere local-linear field effects are found, at all scales.
 - The Physical Vacuum exists and evinces self-organizing criticality in measurable, quantifiable, replicable and reportable behaviors, attributes and effects.
 - The Zero Point is the gateway between the Physical Vacuum and L^4 . The Zero Point is measurable, quantifiable, replicable and reportable in terms of its behaviors, attributes and effects.

13. Observations

At some point in our discussion, we are compelled to ask the fundamental question, the only one that really matters.

"Is consciousness, as reflected by Descartes' Cogito, ergo sum, merely a manifestation of a sufficiently sophisticated complexity in matter, or does matter arise from a causal plan, a Source, such as the one described in the ancient Hindu book of verses known as the Vedas?"

This is not the question asked by science. Instead, science operates *a priori* on the premise that 'physical stuff' is, by definition, fundamentally distinct from what Descartes called "spirit stuff." After three centuries of thinking and working in this way, we have inherited a deeply embedded cultural prejudice which altogether denies that physical stuff and the stuff of Consciousness are in any way related.

Before we can engage in this dialogue, it is appropriate to define our terms. As a matter of practicality, the authors have opted to define Consciousness in terms which attempt to embrace both scientific and metaphysical conceits. For the purposes of this discussion, consciousness is defined as

"...an underlying, primary field comprised of undifferentiated information which is characterized by infinite potential, operating in a manner which is self-referential in all-where/all-time at all scales."

In the language of the ancient Eastern traditions, this is referred to as the One. In the language of physics, it is referred to by Maxwell and Whittaker as the primary field of infinite scalar potential. In terms of Y-Bias and Angularity Theory, the Source is referred to as the Physical Vacuum. According to this physical model of Consciousness, the authors posit that

- Consciousness is speciated and individuated in the same way, according to the same organizing principles, as Time, matter, light and all other aspects of Descartes' 'physical stuff' found in L^4 .
- Consciousness is expressed in terms of non-local/non-linear attributes which are known to couple with the local-

linear physical aspects of L^4 via known coupling constants.

If these findings approach a reasonable level of correctness, it is consistent to posit a number of interpretations based on them.

1. The universe we see is not similar in reality to the universe described by mainstream science, as found in the standard physical model. While the standard model can be relied on to describe some phenomena occurring above the fourth scale of organization, it is fundamentally limited by its reliance on a number of unsupportable presumptions.
2. The source of potential energy available in any locale in the cosmos from the Physical Vacuum, via the Zero Point, is accessible and absolutely unlimited.
3. Understanding how the fabric of L^4 is woven makes it possible to engineer the derivative SOC effects we have defined as matter, energy, field effects and time by harnessing the Y-Bias, Angularity and other principles embodied in Self-organizing criticality, as they operate in L^4 , to create and deconstruct the cosmos, as part of an infinite, never-ending cycle, to satisfy our own requirements.

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equation meets or exceeds a minimal quantum limit, shown in Self-organizing criticality as the function $1/f$, it remains bound by a nexus considered to be a zero point or 'seed' in fractal geometry. When the noise threshold $[1/f]$ is breached, however, the data or resulting physical phenomenon then becomes self-sustaining until the next noise threshold is reached.

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