

**Complexity from Intention
with a Purpose**

**Evolution of Life
serving
Consciousness**



An experimental approach to demonstrating how it is possible



Contents

[I] Introduction	3
[II] $QR := \text{Gravity/Infinity} = \text{Unity} \Rightarrow \text{EPR} \Rightarrow \text{CQER}$	9
[III] A Molecular Topology Suitable for Life = Sense-infused Awareness and Creativity	21
[IV] Cells are the atoms and molecules of aware-capable systems	29
[V] Microtubulin as quantum biocomputer alpha, RNA/DNA as quantum biocomputer beta	36
[VI] Pervasive and Ubiquitous Life = logical consequence of physical existence "Esse est vivere" "Esse est vivere est cogitare"	45
[VII] Empirical Investigation and Demonstration	50
[VIII] Recapitulation and Moving Forward	55



Introduction



Two ways of seeing, perceiving, understanding. Are they equivalent – always?

We've been through this a lot with wave-particle so-called duality which some of us argue is not a duality indeed and not a problem at all. The same can be said for quantum superposition and entanglement.

But there are other basic views about the Whole of what we are and how to make sense of it and live with it. This is not only about physics or the realm of the un-seeably small.

Perhaps there is a Forward and a Backward way about understanding certain Basics, like the Universe and What-Is and Life and Consciousness... Which comes first, one may ask.

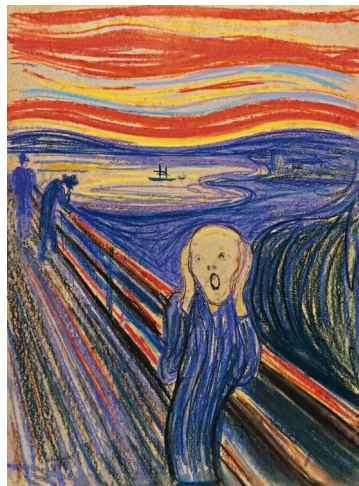
As our science and technology has matured in its tools and scopes of measurement, and as we have departed from seemingly mythocentric, theistic, personalistic views about All This, we seem to have come to view things Backwards about what is, how things become, and about where Life and Mind figure into this Universe.



We have come to think of complexity in form, structure and function as something accidental, and that Mind – Sentience and Consciousness – and Life Itself – arises as an accidental falling-into-place of all the jigsaw puzzle pieces, as if it’s just “Voila!”, and there we have it all, a very rare and, some would say, an “only here” kind of event.

This sounds like a famous and die-hard view of cosmology that was popularized by a fellow named Ptolemy and which sent a view contrarians into prison, exile or to the pyre...

Perhaps there is a radical, revolutionary – (R)Evolutionary – new perspective about many things, starting with fundamentals like randomness, order, potentials, probability densities, gravity, and how so-called “entanglement” is the essential state of be-ing, and that without this mysterious superposition state of quantum mechanics there can be no spacetime at all, nor the phenomenal implications of general relativity...



There's also this problem of Attitude and Fear.

Yes, fear – something usually not discussed openly in theoretical physics, molecular biology or neuroscience. Something that bespeaks emotion and psychological states of the Human Observer - in this case, scientists, including cosmologists, theoretical physicists, chemists, biologists and complexity theorists with elegant models of how Universe and Life got to be the way that we now observe.

Issues – and fears – about identity, and finite-ness, and what are the boundaries of “self”, and what is lost (but may otherwise be gained) in the Collective Network of our existence. This kind of talk bothers a lot of people. It can be identity-threatening.

Recall that long ago, “consciousness” meant “con + scire” – “knowing with”, “awareness with”. Then in more recent times the “con” seems to have lost that meaning of “together with, as one, unified”.

Can someone really be conscious all alone, if there were no one else, and that means not only beings of the same shape and size and appearance, but any beings?

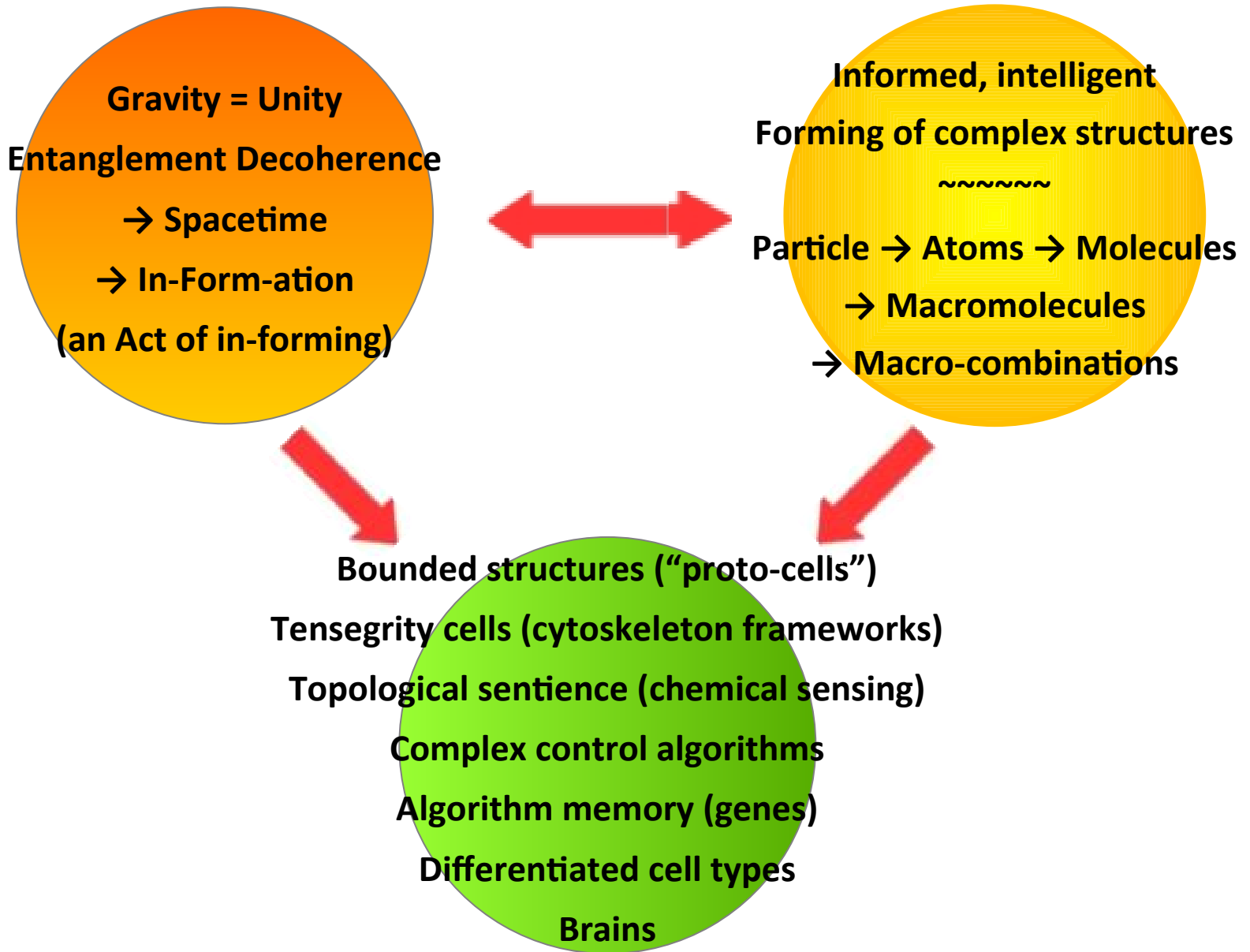


What if Life Itself is an essential nature of this Universe and not an epiphenomenon, not an accident, not a rarity? What is MIND is at the center of it all, the

“The force that through the green fuse drives the flower”

What if the Emergence of Complexity, Order, Structure, all the way up to biped hominids who can think up equations about quantum mechanics and general relativity, is not driven by a huge number of random and unrelated events but instead – what if the emergence from the random, from the Brownian Motion of it all, is guided by an algorithm that is optimizing the energy, minimizing the expense, following the Least Action Principle, for producing forms and structures that enable, by employing complexity that derives from underlying pre-quantum and quantum-scale randomness, the production of a multiplicity of sentient-capable diverse-coordinate viewpoints and imagination-generators, in order for

Universe to See Herself in All Her Wonder and Beauty



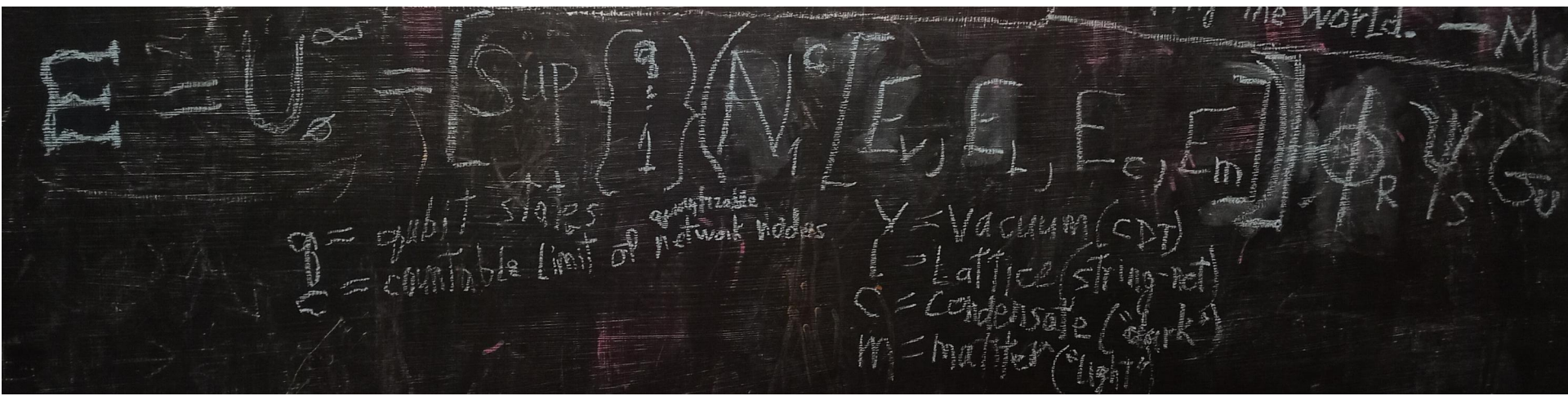


QR = Gravity/Infinity = Unity => EPR => CQER

A few remarks about why things want to come together – one can call it “Primordial Love”

Gravity as we call it is not an interactive force like EM, Strong, Weak and even a speculated “5th force”. It is more of an Identity than a “force” as we usually think of it.

Gravity is a Unity. We feel and measure a separation between components of a whole that have been separated by the emergence of spacetime (or rather, space, with time as an apparent consequence). This unity also is an in-finity. Before there is spacetime, there is no extension, no distance, no separation as such. Space implies distance implies finitude. In-finity in this meaning is not some indeterminate distance that cannot be measured because it is so “big” but the prior be-ing “before” there is any distance, any separation.

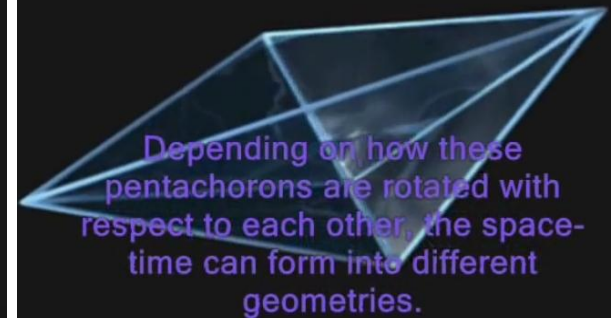
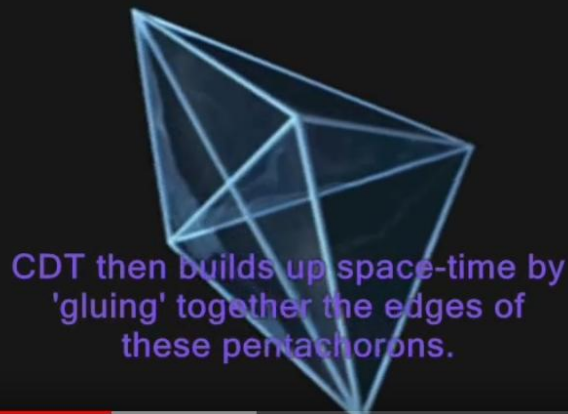
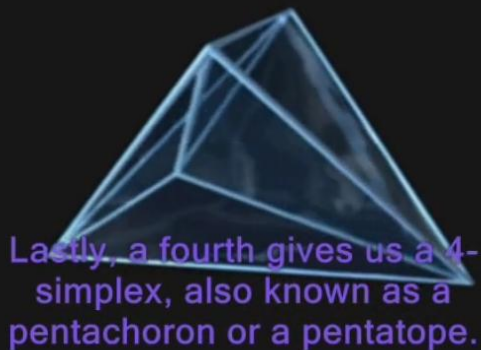


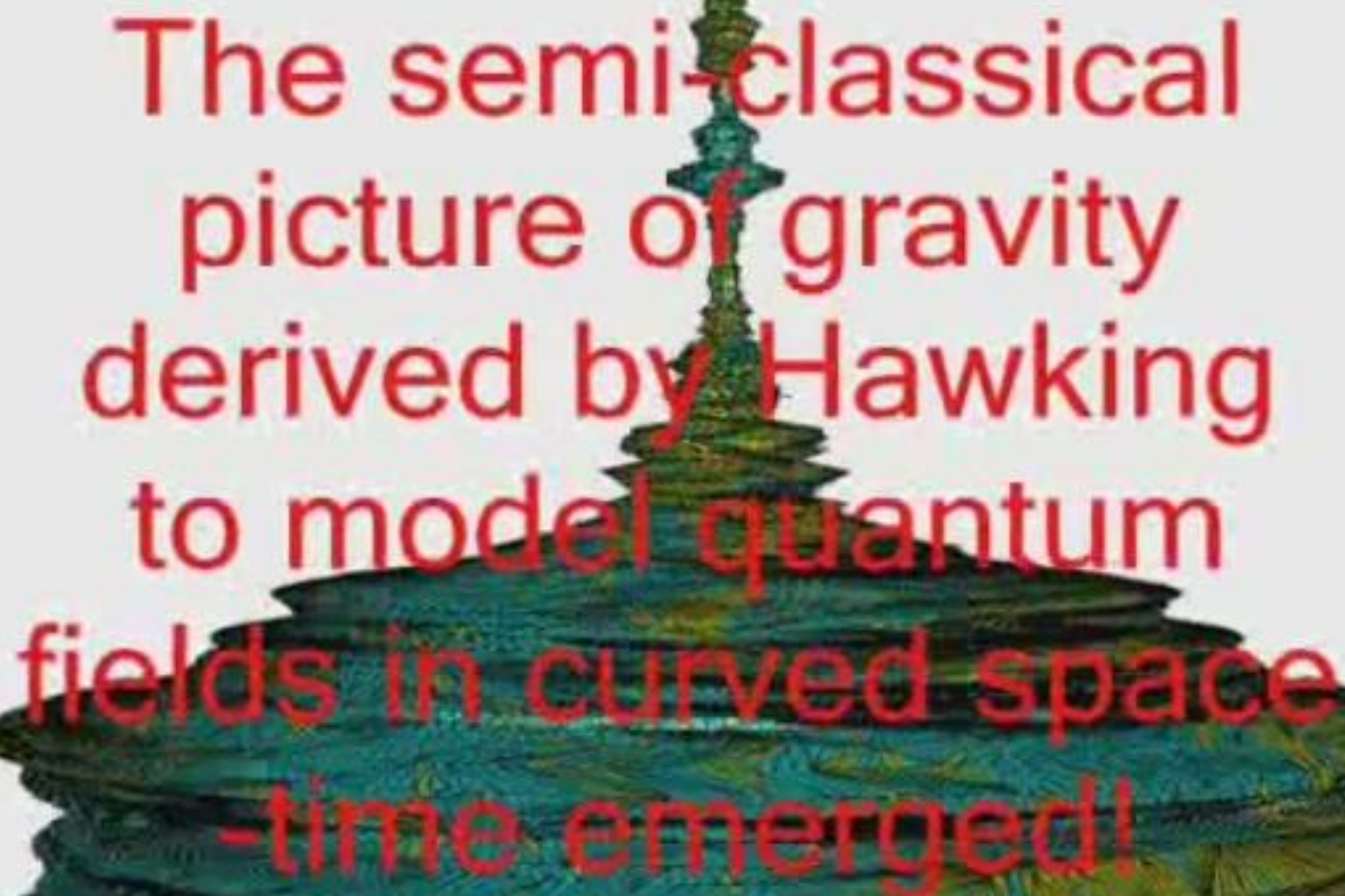
The pathway to matter starts with pre-spacetime networks

CDT – Causal Dynamical Triangulation (Loll, Jurkiewicz, Ambjorn, Gorlich, Watabiki, et al)

→ → → String Net Liquids (Wen, Levin, Lee, Freedman, Kitaev, et al)

→ → → “Collapse” (closure, decohering) of “entanglement network
= Separation (ex-tension) = probability-density locations in
spacetime





The semi-classical
picture of gravity
derived by Hawking
to model quantum
fields in curved space
-time emerged!



3:57 / 9:31



lex

String Net Liquids are pre-particle topological condensates

but their logics show up in ... the macroscopic domains
where there are tangibles like minerals and cells...

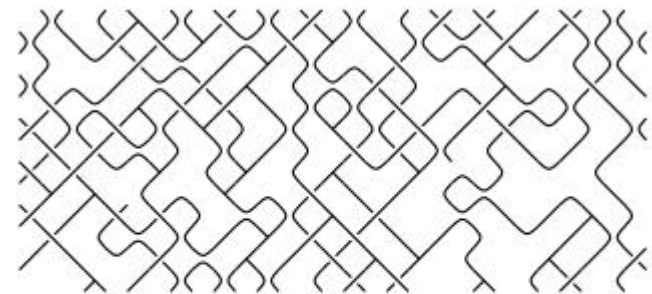
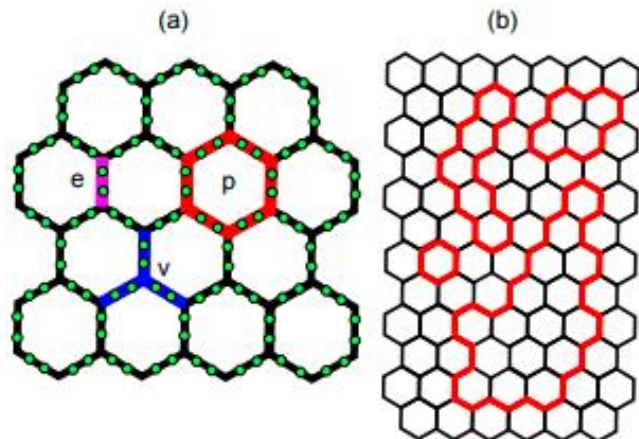
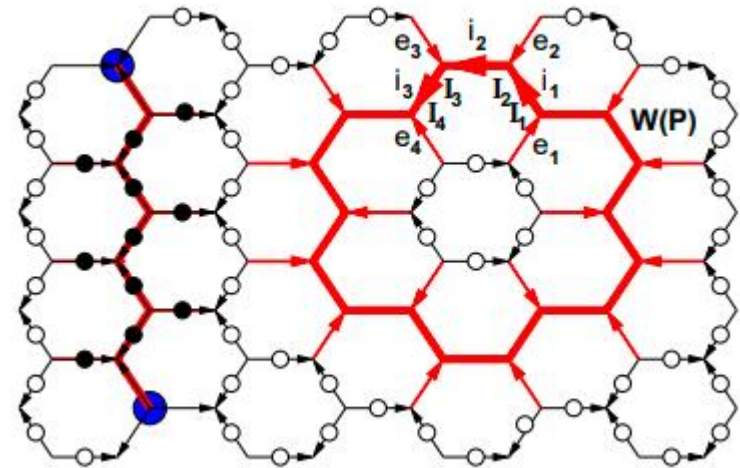
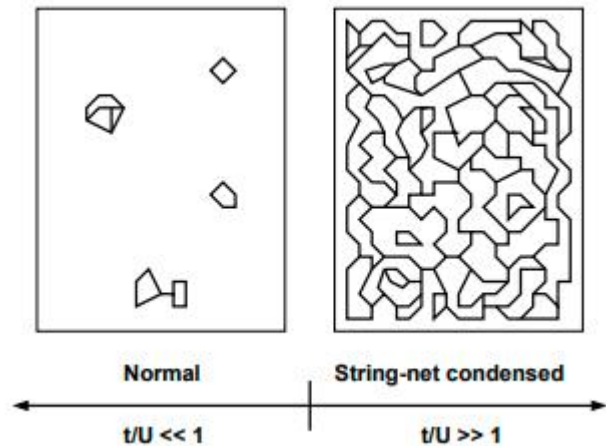
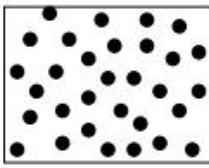
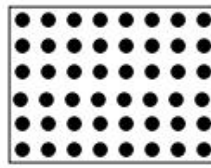


FIG. 1: A picture of quantum ether: the fluctuations of the string-nets give rise to gauge bosons (such as photons). The ends of the strings give rise to fermions (such as electrons).

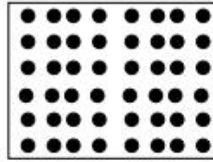


(a)

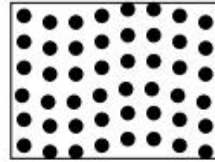


(b)

FIG. 15: (a) Particles in liquids do not have fixed relative positions. They fluctuate freely and have a random but uniform distribution. (b) Particles in solids form a fixed regular lattice.



(a)



(b)

FIG. 16: The atomic picture of (a) the compression wave and (b) the transverse wave in a crystal.

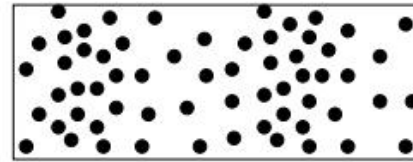


FIG. 17: The atomic picture of the compression wave in liquids.

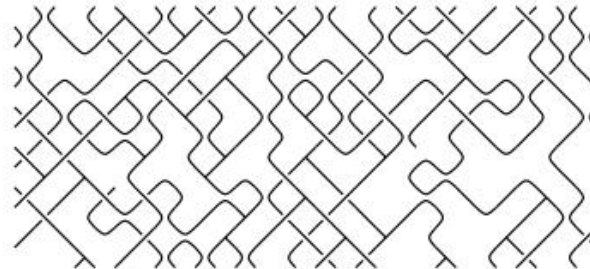


FIG. 18: A quantum ether: The fluctuation of oriented strings give rise to electromagnetic waves (or light). The ends of strings give rise to electrons. Note that oriented strings have directions which should be described by curves with arrow. For ease of drawing, the arrows on the curves are omitted in the above plot.

String Net Liquids are pre-particle topological condensates

but their logics show up in ... unusual crystals ...
and in tubulin and filament nets making up cytoskeletons

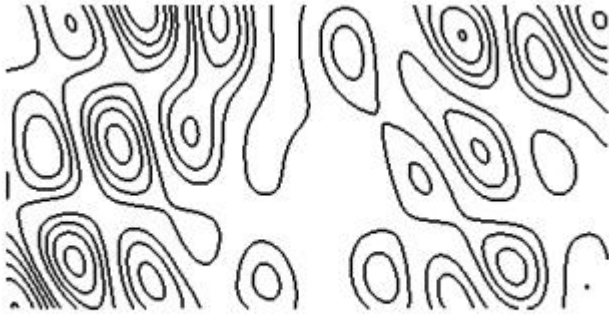


FIG. 19: The fluctuating strings in a string liquid.

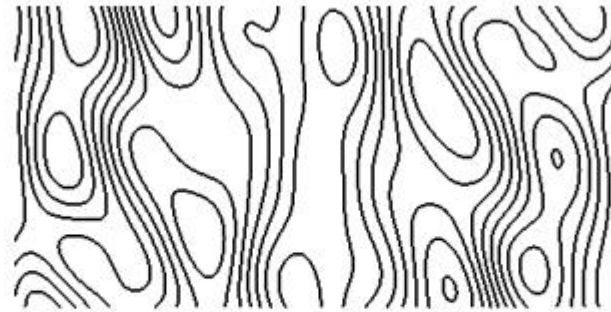
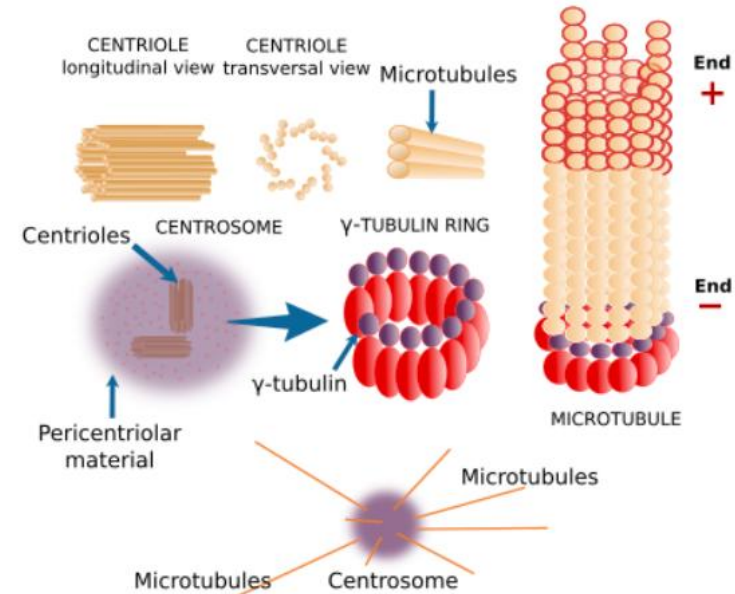
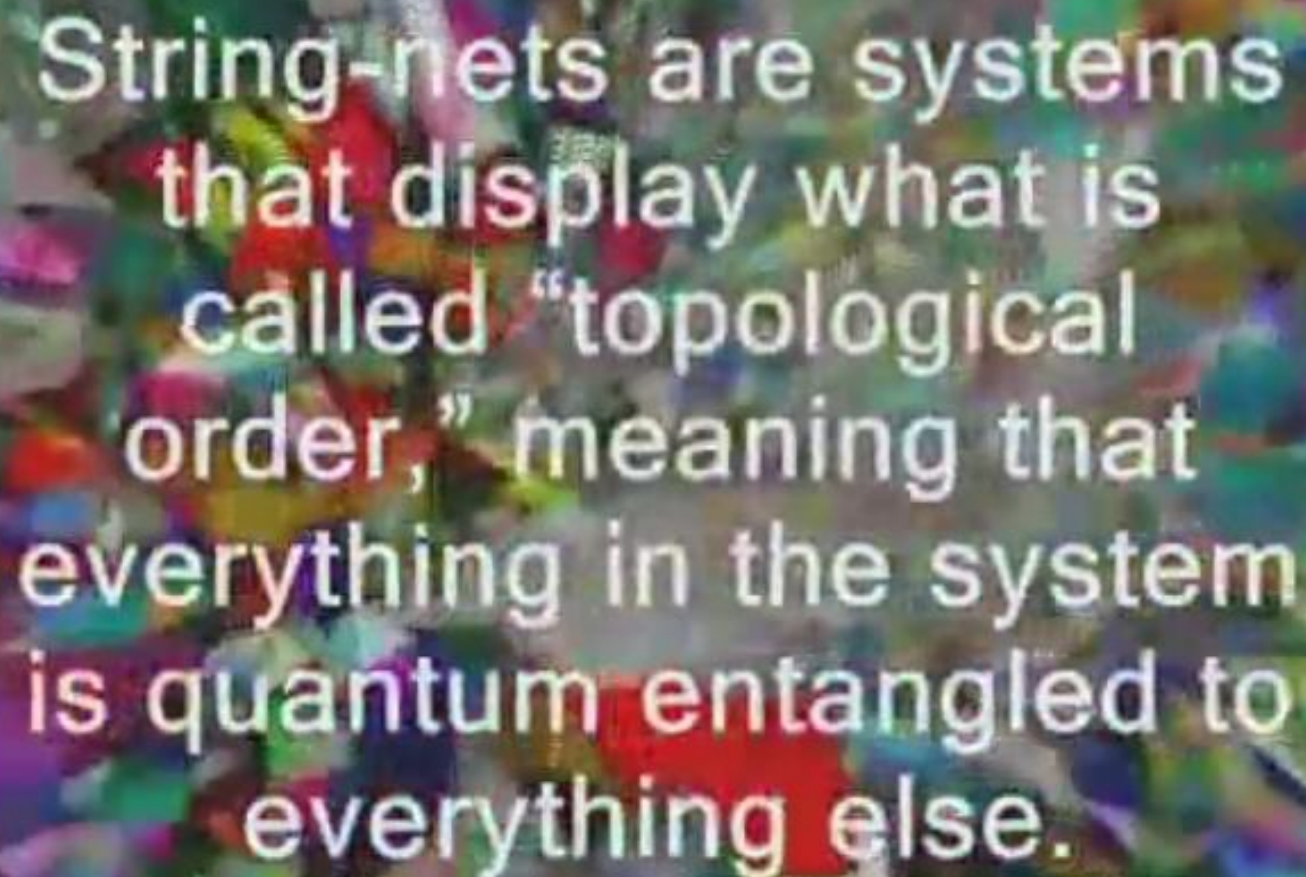


FIG. 20: A “density” wave of oriented strings in a string liquid. The wave propagates in x -direction. The “density” vector \mathbf{E} points in y -direction. For ease of drawing, the arrows on the oriented strings are omitted in the above





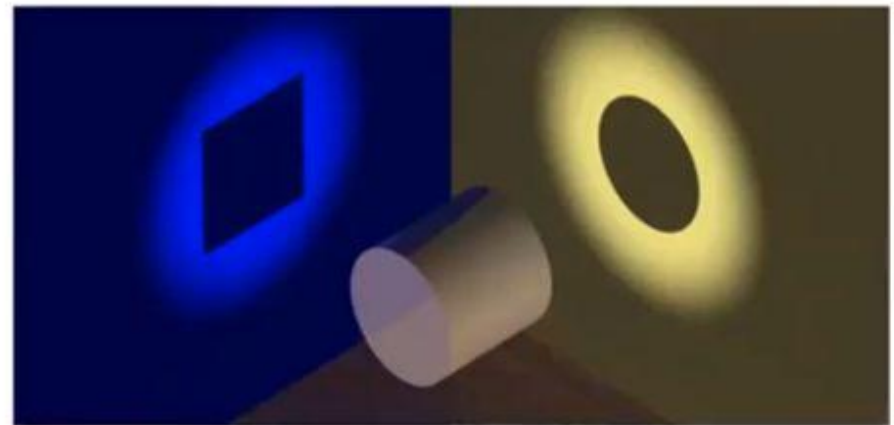
String-nets are systems that display what is called “topological order,” meaning that everything in the system is quantum entangled to everything else.

Categorical symmetry lives in one higher dimension

To gain a deeper understanding of categorical symmetry $\mathbb{Z}_2 \vee \tilde{\mathbb{Z}}_2$, such as their non-trivial “mutual statistics”, we realized that categorical symmetry actually lives in one higher dimension.



Categorical symmetry
→ symmetry and dual symmetry



in that we realize that the categorical
symmetry actually live in one higher

Do we really believe elementary particles/forces arise from an ocean of qubits (which is the space)

Can ocean of simple qubits (quantum information) really produce all kinds of matter and rich world?

- Elementary particles & fundamental forces described by the **standard model** are rich & complex

Eight wonders or mysteries of our universe:

- Identical particles (qubit ocean \rightarrow bosons)
- Waves that satisfy Maxwell equation (photons, light)
- Waves that satisfy Yang-Mills equation (gauge fields)
- Particles with Fermi statistics (anti-commuting fields)
- Fractional angular momentum (spin-1/2)
- Only left-handed ^{can originate from but there's nothing simpler than} fermions couple the Yang-Mills waves
- Lorentz symmetry
- Spin-2 bosons with only two-components (gravitons)

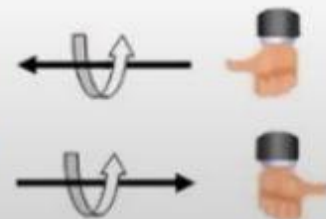
Three Generations of Matter (Fermions)

	I	II	III	
mass	2.4 MeV	1.27 GeV	175.2 GeV	0
charge	$2/3$	$2/3$	$2/3$	0
spin	$1/2$	$1/2$	$1/2$	1
name	u	c	t	γ
	up	charm	top	photon
	d	s	b	g
	down	strange	bottom	gluon
	ν_e	ν_μ	ν_τ	Z^0
	electron neutrino	muon neutrino	tau neutrino	weak force
	e	μ	τ	W
	electron	muon	tau	weak force

Quarks

Leptons

Bosons (Forces)



Long-range entangled qubits \rightarrow Matter/Interaction

1. Identical particles
2. Wave satisfying Maxwell equation (light, EM interaction)
3. Wave satisfying Yang-Mills equation (strong-weak interaction)
4. Fermi statistics
5. Fractional angular momentum (spin-1/2)
6. Only left-hand Fermions interact with Yang-Mills wave
7. Lorentz symmetry (not naturally, needs fine tuning)
8. Spin-2 bosons with only two-components \rightarrow gravitons?

- **New world-view/unification:**

- Space = An ocean of qubits
- Qubits form a string-net liquid
- Fluc. string-net \rightarrow photon, gluon
- End of string \rightarrow electron, quark



- New actor: **qubits with many-body entanglement.**

- New math: **braided fusion higher category**

Scroll for details

Universe begins in superposition with Itself

The Act of “collapse” of superposition-entanglement at the Planck scale on a cosmological extent gives rise to Gravity as the implicit, innate pulling-back-together-into-One of that which by spacetime separation has been “rent asunder”.

Then there emerge EM, W and S – which can best be understood as One Interactive Force operating with different interaction-entities (particles and relations – i.e., proximate (W, S) or not-proximate (EM)).

EMF* (EM+W+S) keeps the points (parts, particles) both Apart and Together and Interactive with one another. It is the way Gravity manifests between quantized (point-reduced) topologies. It is the conductive glue and also the separative insulator.

EM-basic = how everything in biology can interact – including at surprising “distances”...

**Now consider that this superposition (“entanglement”)
Never Ends... at any scale...**

What does it imply for biomolecules, cells, brains, societies?



**A Molecular Topology Suitable for
Life = Sense-infused Awareness and Creativity**

Beginning Steps Up the Spiral Staircase

These may be considered claims, hypothetical but evaluable. We need to define what are the best experiments to do so.

Consciousness and the desire to create an infinity of experience

Consciousness is collective, prior to material form and requires a physical universe in order to create experiences from all perspectives and varieties

Universe as a physical place with extension and duration is a construct for projecting idea (form) into manifest idea (finite, distinct, limited-dimensional form)

Cannot be confused by the notion of individual consciousness(es) or minds, which are only finitized, pin-pointed, limited-duration and extension aspects of Mind

Mind seeks to be con-scious - to know-with, to know-together, as one, as a unity, but composed of an infinity of variety of individuated "perspectives".

This requires multiplicity, plurality, of observers and observables. A multiplicity that is open-ended and unrestricted, unbondable, enabling creation of variation, of different perspectives. [Metaphor: projective geometry, differentiable topology]

Mind and Number Theory – a brief Interlude

Mind and consciousness ! $\approx \approx \approx$! Number. Infinity of Real Numbers. Transfinites.

Imagine a Mind that desires to experience everything. Everything possible.

But we say that this is impossible.

But not if one has Infinity and there is no measure, no limit of space or time.

There is only “imagination”.

Consider that every different thought, every percept, every state of con-sciousness is associated with a Number. An in an n-dimensional space, every unique “idea” – not only those we can put into logos-form, with words or propositions – is like a unique number, a unique knot or twist in a conformal geometry... But don't worry about mapping this onto a coordinate system quite yet...

Mind and Number Theory – a brief Interlude

Some History

Creation of set theory by Georg Cantor (late 19th century).

Creation of the theory of functions and of measure theory

and integration theory by French trio Emile Borel, René Baire, and Henri Lebesgue.

Extensions by Dmitry Egorov, Nikolai Luzin, Pavel Florensky and their school, the famous Lusitania.

Every "thought" is a number. Distinct. But between "it" and the "net closest" csn always be another variant, just as it is with real numbers. Integers can give us a "fair approximation" of the "universe of thoughts and ideas" but it is only that, an approximation - and yet, as with integers, this is also an infinity! No limits in any direction, dimension, coordinate system! So it is with all thoughts, all ideas, all feelings and how they can be described, "contained" (never, really, this is at best a rough metaphor, about containment), and circumscribed, circumlocuted, roughly sketched and drawn.

Quantum Potential, Implicate Order and Misunderstandings of Scale

A “field potential” exists at different scales. At the Planck scale, this has been called the “Quantum Potential” as Bohm, de Broglie, Hiley et al have pointed to it, deriving from the fundamental Schrödinger equation and its derivatives:

From $i\hbar \frac{\partial \psi}{\partial t} = \left(-\frac{\hbar^2}{2m} \nabla^2 + V \right) \psi$ there is the continuity equation:

$$\frac{\partial R}{\partial t} = -\frac{1}{2m} [R \nabla^2 S + 2 \nabla R \cdot \nabla S]$$

and the modified quantum Hamilton-Jacobi: $\frac{\partial S}{\partial t} = - \left[\frac{|\nabla S|^2}{2m} + V + Q \right]$

Quantum Potential – at that Planck scale(!) is thus:

$$Q = -\frac{\hbar^2}{2m} \frac{\nabla^2 R}{R}.$$

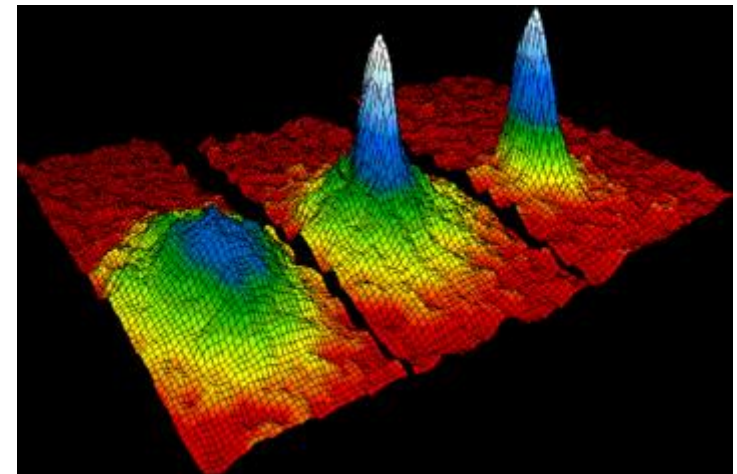
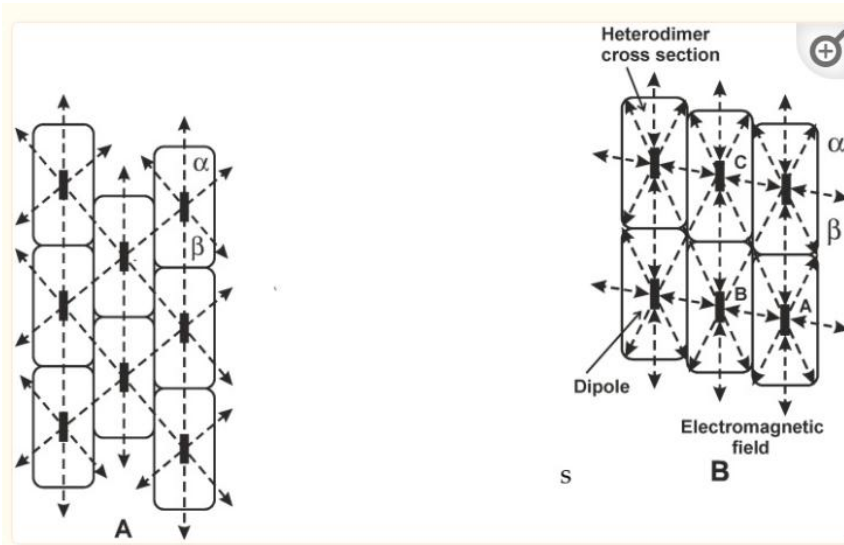
This concerns an Implicate Order, but this is not of “things” (objects, particles or macro-objects) but rather of the *Complete (Universal) Potential*, the totality-set (not just a summation!), the completion of probability densities. It is perhaps better to be called an *Order Potential*.

Implicate Order, Misunderstandings of Scale and Reference, and how Intention figures into the emergence of Complex Form and Structure from Pure Randomness

Remember that even within Prime Numbers there is not true or perfect randomness! It is hard to discern it is there. And those “irrational” numbers like π and $\sqrt{2}$, ϕ – they happen to “build” some very stable rational geometries...

There is Difference at higher scales of complexity and "size" (and "duration"!). Thus we cannot find a "quantum" Order Potential at higher scales, because it is necessarily of a different order (type).

Just as BEC are different from "simple" superposition states between photons and "individual" particles. Just as we have discovered with fractional quantum Hall effects. And with graphene. And... with microtubules.



Reflexive Topological Dynamics implies Biology and Mind

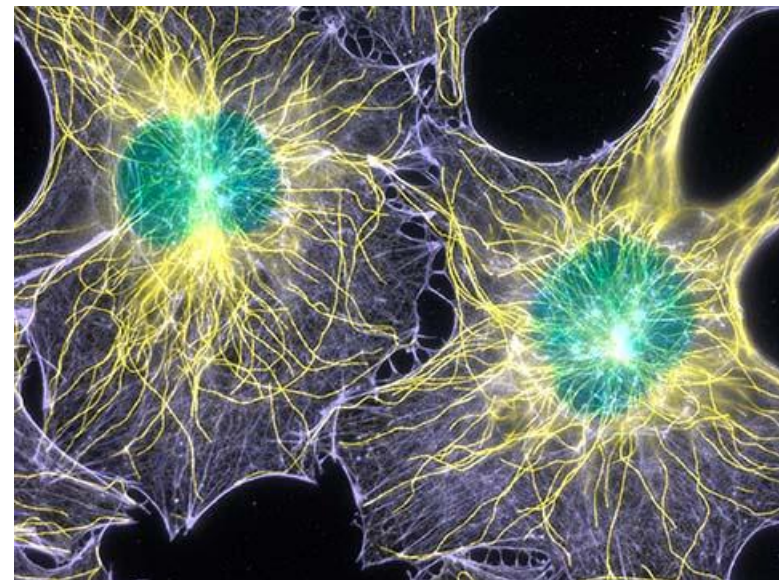
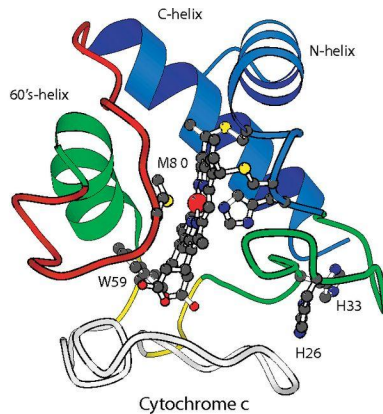
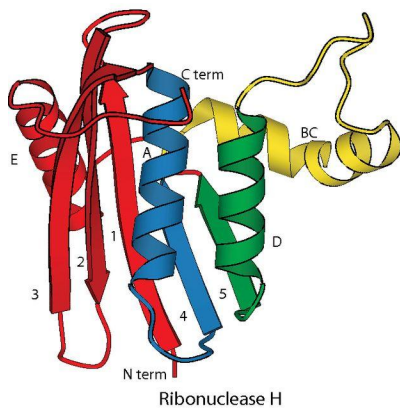
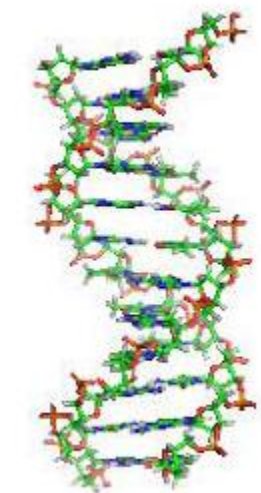
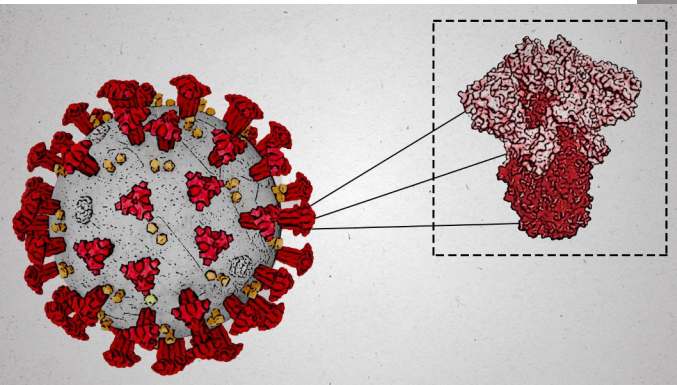
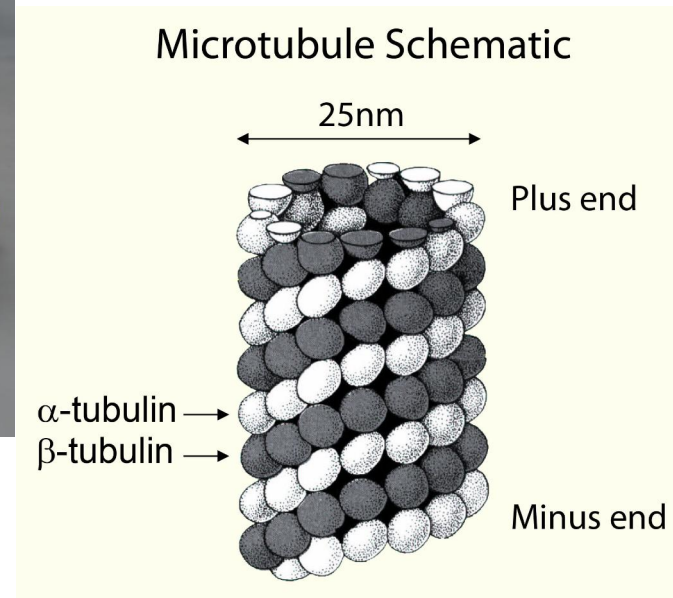
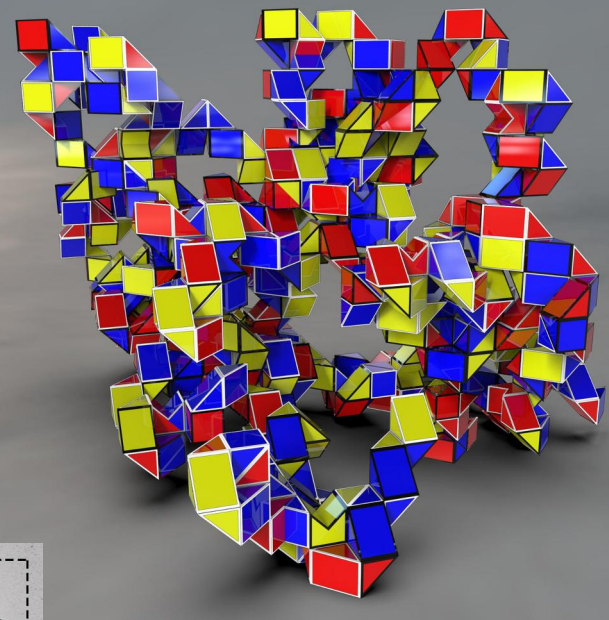
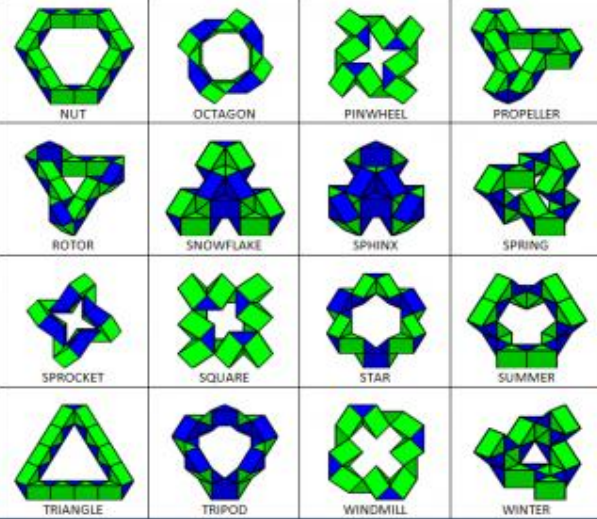
RTD necessarily -->> TBD necessarily -->> TND necessarily -->> PSD

CQER - Coherent Quantum Entanglement Resonance

A new term: CLUST - Coherent Local Unitary Set --- some building-block, physical-like (for example microtubules) - that are complex, multiple points, multiple atoms and molecules, large chain-like, twistable, knottable macromolecules in fact. They can be influenced/controlled into a "collapse" of their wavefunction, their superposition, and this is a decohering process. The influence is, for instance, in fields that modulate the surrounding environment of the CLUST - as in the brain, but not only the brain.

These controlling fields operate as EMF that can be measured and classified in terms of their physical energies -- frequencies, intensities, durations.

Is it possible that a very specific type of geometry – helical units that can be assembled and disassembled in a variety, almost infinity of combinatorics (like the Rubik's Snake), with a minimum of energy, and suitable for operating as channels, conduits, for non-dissipative waves – *solitons* – is universally the “optimal building block” for systems (*living organisms*) that will be capable of a wide, almost infinite, variety of states (aka *sentient-capable experiences*)?





**Cells are the atoms and molecules of
aware-capable systems**

Autocatalysis → Macro-structures → Control algorithms operating in a molecular quantum computer

This recent paper, “Small-molecule autocatalysis may have paved the way for the emergence of evolution by natural selection”, offers a connecting link to understanding more about how Mechanism Serves Purpose in matters of emergent complex structures.

[<https://phys.org/news/2023-08-small-molecule-autocatalysis-paved-emergence-evolution.html>]

This points to evidence for how things can begin (have / had begun), leading to topologically unique (separable, delineable) entities, cellular-like.

It fits with other studies and findings including what I now read from Anirban Bandyopadhyay's work, and also from Vincent Ouazan-Reboul and the group at Max Planck Institute for Dynamics and Self-Organization.

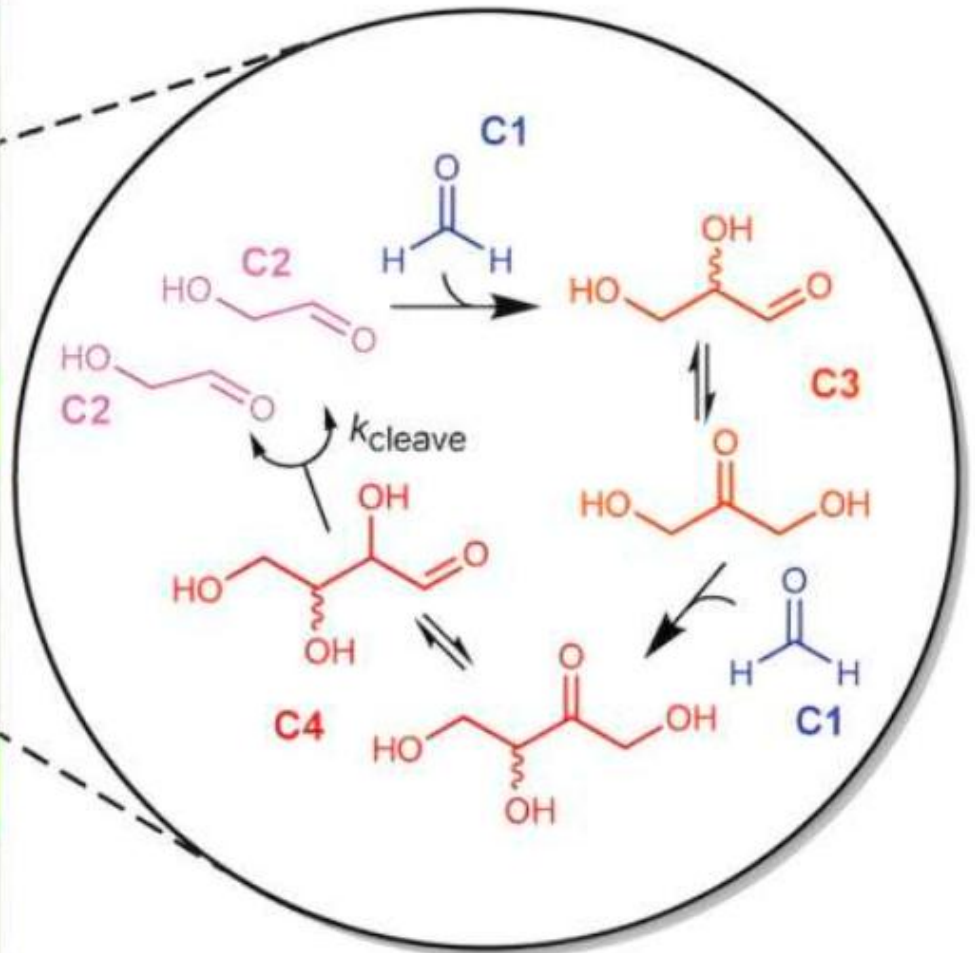
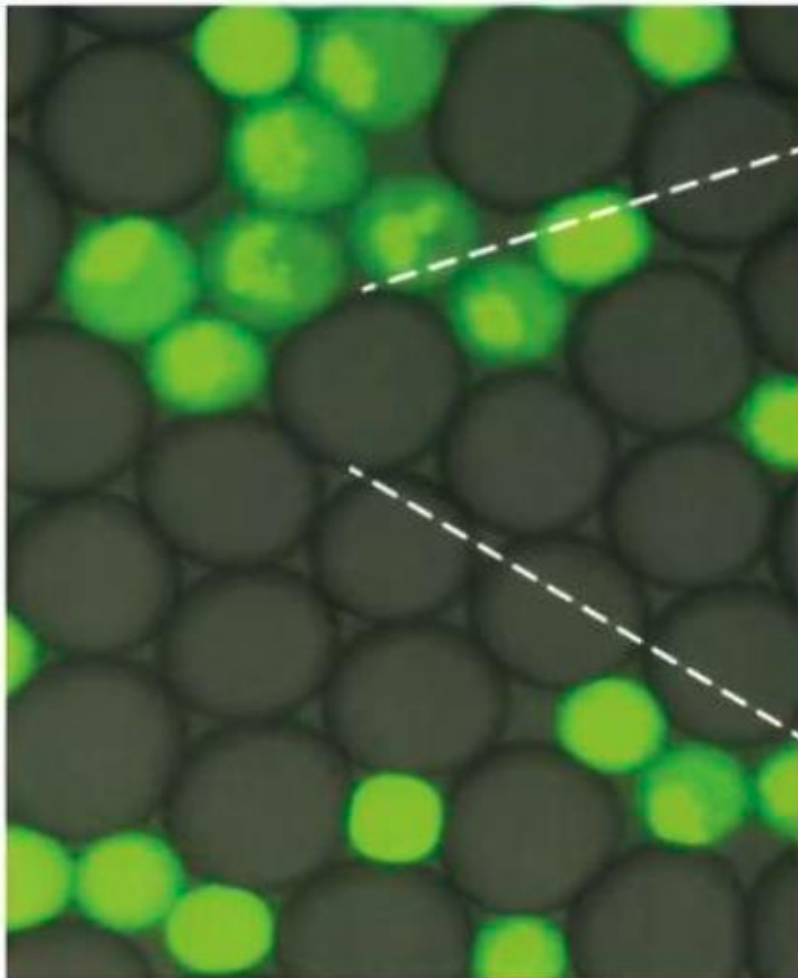
“Self-organization of primitive metabolic cycles due to non-reciprocal interactions” by Vincent Ouazan-Reboul, Jaime Agudo-Canalejo and Ramin Golestanian, 26 July 2023, Nature Communications.

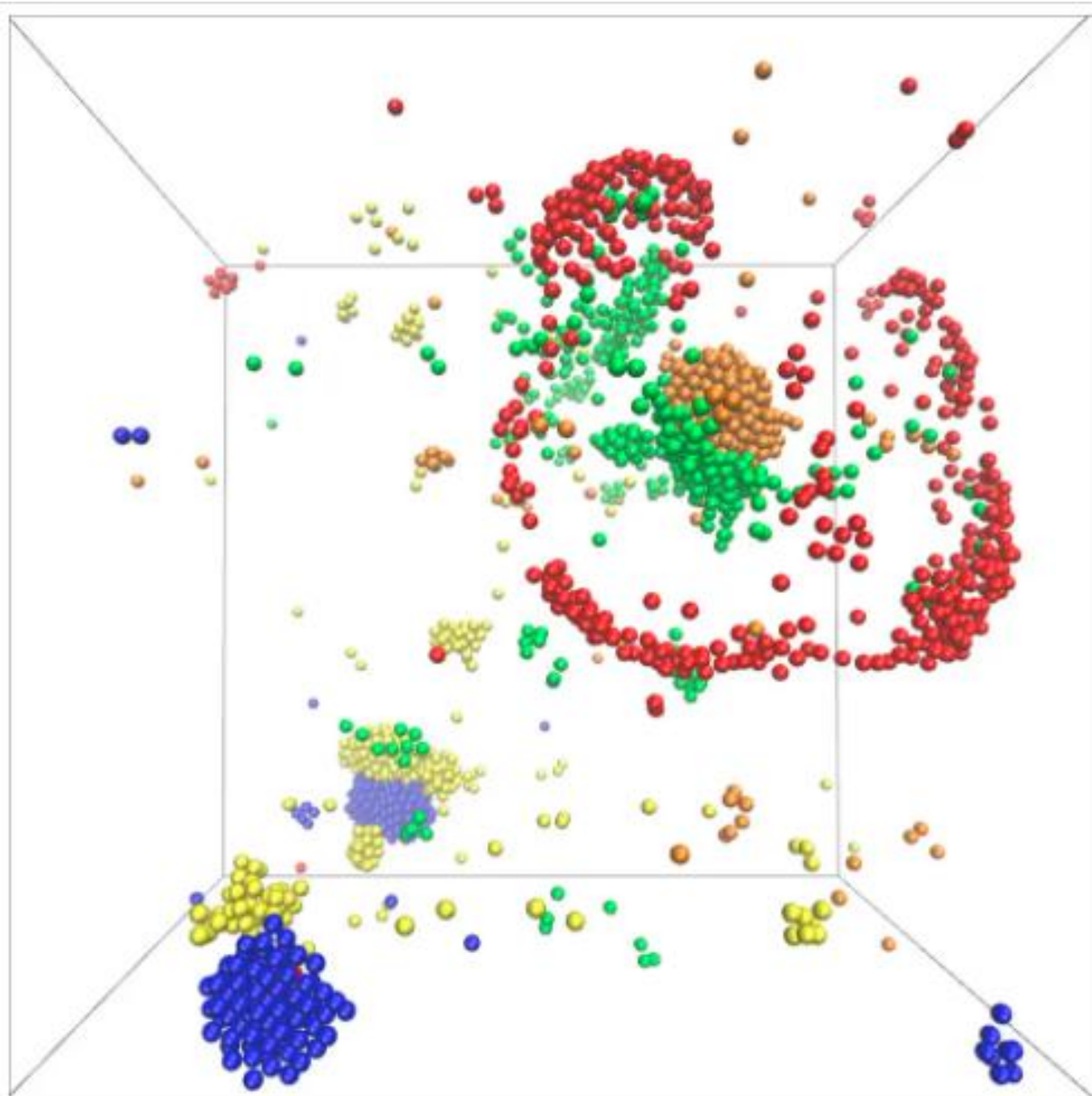
[https://scitechdaily.com/exploring-the-origins-of-life-scientists-propose-alternative-model/?expand_article=1]

Self-replicating microspheres. Molecules, isolated within their membranes.

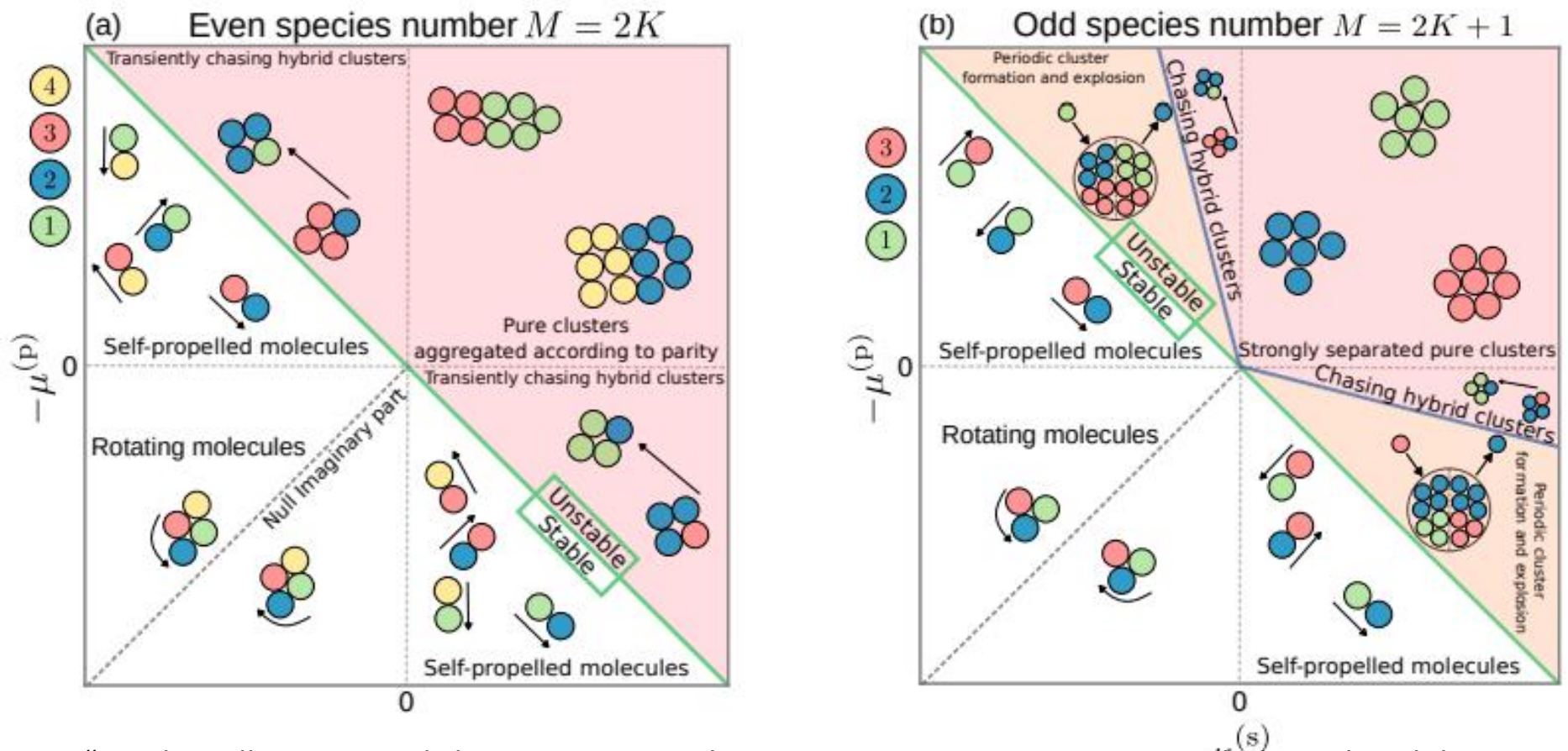
Experiment: performed with a formose reaction, an autocatalytic sugar-producing reaction. Formaldehyde is the “fuel” and involves the circular transformation and propagation of glycolaldehyde molecules. No enzymes required.

Small-molecule autocatalytic reactions. No genetic material or enzymes. Growth and division of compartments occurs and repeats. In essence, these are new generations.





A new model describes the self-organization of catalysts involved in metabolic cycles. Different species of catalysts (represented by different colors) form clusters and can chase each other. Credit: MPI-DS / LMP



“Catalytically-active and chemotactic particles participating in a primitive metabolic cycle exhibit a variety of structural complex collective behaviour.”

The molecules and clusters are able to interact over large distances. They undergo spontaneous and exponentially rapid formation into clusters that supports their metabolic function.

“The observed variety of emergent structural behaviour with highly precise control over the composition of the constituents of the metabolically active clusters hints at a significant possible role for catalytically active molecules at the origin of life: the molecules that are metabolically connected to each other will preferentially and efficiently form active clusters together, hence

serving as potential candidates for the nucleation of early forms of life”

Microtubules implement sustainable, stabilizable control structures

Building upon such auto-catalysis, microtubules enter the equation. More complex-possible topologies, changes, movements. and molecular memory in the knots, twists, threading and weaving of the tubulin which becomes a cytoskeleton.

Then there is a "place" (shape, positions, *orientations* (electromagnetism!) created and enabled, for dynamic behavior. Movement and circulation both, externally, yes, but very importantly, internally. This allows development of specialization of functions (biomolecular processes) inside the "new thing that is a cell".

Now the cell can measure its boundaries and its topological connections with its neighbors and its environment, cells or not cells - the molecular "sea" in which it is embedded.

And, the EM field around it!

This leads to differentiation of functions inside, and differences of response to both external and internal conditions, all of which are expressed electromagnetically, and btw, often in necessarily solitonic wave forms. The “weather” changes, and one responds with different ways to exist within the changed environment.

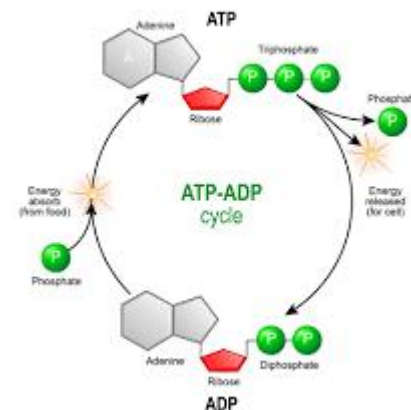
How EMF and specific acoustics (ultrasonics) may implement the healing and rejuvenation processes observed in diverse cases (tissues, diseases, damage)

The processes observed as autocatalytic, leading to cell-like “compartment” formation, and as “structural complex collective behaviour”, are not only in some distant paleobiological past, nor restricted to events occurring outside of “known and accepted” living systems – viruses, bacteria, or cellular organisms.

These processes occur throughout living organisms.

Moreover, we observe coherence at multiple scales in cellular metabolism and point once again to the essential role of non-dissipative wave functions – solitons – in elementary energy transfer (e.g., basic ATP-ADP cycle).

We suggest that microtubules and other filament chain molecules operate in a delicate range of harmonics and when there is sufficient disturbance, from chronic stressor agents or acute trauma, there is need and often incapacity for regaining the “equilibrium” (which qualitatively is described as a healing and recovery process). Very select EMF and acoustic energy, that penetrate to tissues that are central to the self-healing process, act as “Pilot or Guide Waves” that “set the tone” for what may be reasonably called the “orchestra” of integrated synergy within the biological organism to “Heal Thyself”. Microtubules particularly appear to be central as the mechanism for receiving these “Pilot Wave” signals and regaining their equilibrium.





**Microtubulin as quantum biocomputer alpha,
RNA/DNA as quantum biocomputer beta**

From Clusters and elementary Cells with Microtubulin Nets to Cybernetic Complexity and the need to represent and store algorithms distinctly

The next step that logically (!) and physically (biochemically) follows is to develop a system of Control. A mechanism for managing and orchestrating these different algorithms of responsive actions for many different conditions.

This is where the development of stored codes comes into the picture.

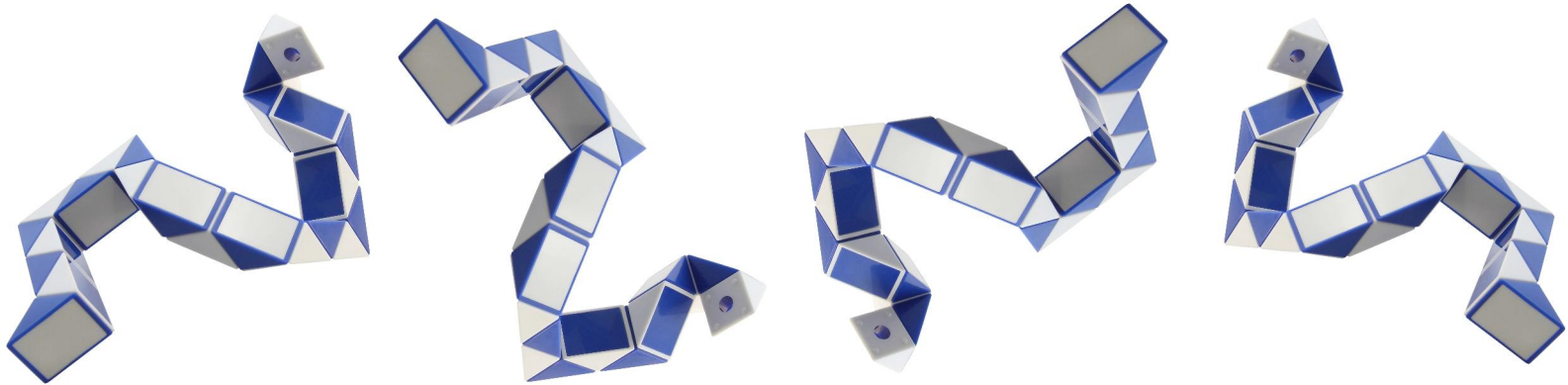
From small-molecule and cluster-aggregate assembly and disassembly, leading to cell-like formations, the next level is that of microtubule-implemented actions (which are geometrically created in the dynamics of the microtubule assembly/disassembly).

These are "translated" into storage code expressions that dictate the assembly process for chunks of useful polymers that can be combined in different sequences to make the variant-design larger macromolecules for performing specific reactions inside the cell.

But eventually the cell is evolving into a much more complex machine and there is massive “surface computing (“field computing”) going on, which brings about more complex cybernetics – the control and regulation of the many parts and their cohesion as one Whole.

From Microtubulin Nets to Nucleic Acid Data Representation

Thus, proteins built like "Rubik's Snake" models. Again, topology - shapes, and boundaries - containing Information, being the essence of Natural Quantum Computing.



Well, then, the next process in all this leads directly into nucleic acids and genetic models of storing coded instructions. Using different kinds of long-chain easy-assembly, easy-to-reproduce, easy-to-modify ("CRISPR" style, for a good example), to take on the now growing and demanding task:

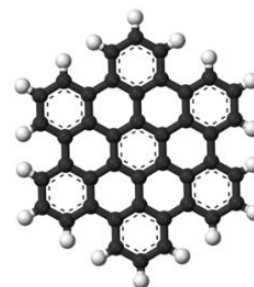
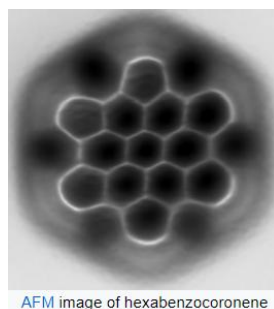
SAVE the Algorithms and call them up ("execute") as necessary, in a programmed and also responsive-ready way.

Soon enough, one has viruses and bacteria, and then eukaryotic cells with nuclei - more use of topology and boundaries for information and control!. And then the path is clear, leading - by the Same fundamental principles, rules, algorithms - to what we see all around us and in us now.

Initial Required Building Blocks - Rings

Back to those aromatic rings that are critical for starting all this. The geometry is what is the essential thing, and the choice of which atoms is for making rings with those shapes and EMF properties and capabilities. PAH (polycyclic aromatic hydrocarbon) hypotheses and models provide a variety of mechanisms and evidence of ample ingredients in diverse locations and environments including far different from Earth.

Fullerenes including C_{60} offer the prospects of “primordial scaffolding structures”, purely-molecular proto-cellular structures, that could provide frames for PAH assembly processes as have been hypothesized by Oró, Platts, Ehrenfreund and others, leading toward RNA auto-catalysis (ribozyme formation and metabolism).



Once again, a refrain may be heard: “Mechanism is one thing, but is it enough, without Purposive Directed Function – the Algorithm governing the mechanics?”

Quantization Extending Up the Scale implies Rings and Spheres and then Proto-Cells and then MT and RNA

If one General Principle everywhere is about quantization – point-like form and structure, in the simplest being what we see in string-nets and proto-matter (so-called “dark matter”) topological condensates, and what gets more well-defined in boundaries of probability densities as fundamental bosons and fermions ---

Then let us consider how this process would manifest at increasingly complex and larger spacetime scales.

Simple rings like we find made of mainly the most common atom (H) and one of the most common that is larger and heavier than H or He, namely Carbon.

More complex structures that now create closed topological forms – surfaces that are as close to the ideal of a sphere as possible, built exactly in ball-stick form as it were, using the same common building-blocks. Fullerenes, for instance, are easy to make with Knex toys and very easy with enough H and C from stellar activity *all over the Universe*.

Now one has closed spaces. Poincaré’s Conjecture has been proven by Perelman, and the same Ricci Flow applies whether one is dealing with General Relativity of the Universe as a whole or the soccer ball on the field or the billiard ball on the table.

Buckyballs naturally leading to Cells that self-replicate and then differentiate? This could be a “Wow”

Claim:

Least Action Principle Rules Everywhere. Including in the formation of geometries that will attract other geometries and start “mating” and “reproducing”.

Molecular Sex, if you will. (Why not? Sounds like fun.)

Summary | In mechanics (conservative forces only):

Action S is a certain time integral which is “least”^{*} for the true motion between initial positions at t_1 and final ones at t_2 . ^{NOT +}

Non-relativistic, no magnetic field case $S = \int (\text{Kinetic Energy} - \text{Potential Energy}) dt$

Eg. single particle, one dimension P.E. = $V(x)$; $S = \int_{t_1}^{t_2} \left[\frac{m}{2} \left(\frac{dx(t)}{dt} \right)^2 - V(x(t)) \right] dt$.

“least”^{*} → Not really least, just extremum ← means first order change = 0.

Can this be extended to the Emergence of Structure in Molecules and thus to Living Systems?

Action (S) = integral of the Lagrangian L between two instances t1 and t2.

$$\mathcal{S}[\mathbf{q}, t_1, t_2] = \int_{t_1}^{t_2} L(\mathbf{q}(t), \dot{\mathbf{q}}(t), t) dt$$

The path taken by the system (in motion between configuration states q1 and q2 and spanning time intervals t1 and t2) is such that the action is stationary (no change) to first order.

This action is not always a minimum. It is a minimum principle for sufficiently short, finite segments in the complete path.

Suggestion for Where to Point some “telescopes” and “microscopes”:

TOPOLOGICAL TRANSITION POINTS (PHASES)

Can we demonstrate that it is easier – less expense of energy, less E required for the necessary reactions, less entropy, less instability and risk of things falling apart (literally) – and MORE capability to contain INFORMATION – in the following types of phase transitions which are not about “states of matter” but states of Topological Order? (and thus, capability of both storing information and doing computation in a manner that, yes, involves quantum superpositions and qubit behaviors - ???

Topological Order Phase Transitions (TOPT)

Consider a few possible TOPTs and then think in terms of where to look in terms of molecular concentrations in vast regions of Space and combinations that can easily, surely, unavoidably occur in nutrition-rich womb-like environments such as Earth and a few other worlds offering comparable combinations of both “matrix” (equivalents of water and atmosphere) and “building block” ingredients.

- ◆ Moving from aromatic ring combinatorics to stable quasi-spheres like buckyballs
- ◆ Auto-catalytics that create compartmentalization and multi-molecule assemblies that have different sub-compartments (i.e., no longer just the same quasi-spheres)
- ◆ Polymers – conjugate polymerization that now sets large multi-fold, multi-knot chains in combination (relation) with distinct compartments that all stick together as a whole
- ◆ More elaborate chains which are microtubulin and other similar filaments, being the dominant structure of certain proto-cell compartments
- ◆ Well-defined closed-surface topologies that can distinctively be called CELLS with multiple different compartments
- ◆ Auto-catalytic synthesis of ribozymes that are reactants in two (2) processes: (1) Encoding of information for assembly of other folded-twisted-chain molecules that perform other reactions in the cell, and (2) Decoding of that information in a manner that is in response to signals originating from cellular metabolic events.

Can this be pertinent to practical benefits, in Medicine and Computing, for instance?

Yes.

This kind of investigation is precisely relevant to

- ◆ Understanding healthy and pathological processes where intracellular signaling and control functions are involved, especially MT ↔ Nuclear (genetic) interactions
- ◆ Understanding the mechanisms – the “how and why” of BioEMF actions, especially those involving application of signals (electromagnetic, light, m acoustic) to pathological tissue regions
- ◆ Developing a quantum computing architecture – a machine – that is a Generalizable Heterogeneous Computing Machine – not a “Turing Machine” and not with inorganic-exclusive qubit arrays – and which operates like the quantum computers of viruses, bacteria and eukaryotes.
- ◆ Fine-tuning how to optimize the use of BioEMF and Ultrasonic therapies for specific tissues, organs, pathologies.
- ◆ Developing a radically different type of biology ↔ electronics interface protocol, a new way to “translate” from Brain to Turing-Machine electronics, for instance, and vice versa. Not the ways that have been tried before. This is not fMRI or MEG but something that may not even operate with wires or electrodes at all.



**“Esse est vivere” “Esse est vivere est cogitare”
Pervasive and Ubiquitous Life =
logical consequence of physical existence**

(R)Evolution is scary because it brings Change

We cannot forget the Science exists within the environment of Society and there are a myriad of forces and motives that resist Change.

People have been getting into deep trouble over new ideas, new philosophies, new science, even new “pure mathematics” long before Socrates was condemned to drink the hemlock.

A paradigm that makes Sentient Mind and consciousness central to the laws of not only biology but fundamental physics is refreshing and enlivening and even pleasurable to some but scary to others. It upsets more than a few carts and rafts.

It gets even scarier when the basic science is saying that a really important dimension to your life – to you as a person – is intimately connected with everyone else and not just the people one is accustomed to feeling “comfortable” with but Everyone, everywhere, All of Us – and not only the ones with two arms and two legs and walking around upright.

This probably sounds like something from a Buddhist sutra – and you know what, it should.

Life Everywhere – not just on Earth

It's the natural order of things

Some implications, or at least some directions in which one can begin to think about formulating implications:

- ◆ Quantum mechanics includes the basics for the formation of living systems and it follows straight out of the superpositions and entanglements at the particle level and even prior to there being any particles.**
- ◆ The mechanisms may vary all over the Universe but there seems to be good reason to believe that if we have the same atoms and general distribution of element types throughout the Universe, then we should likely find a lot of the same elementary compounds, including simple organics like aromatic rings.**
- ◆ It is also looking reasonable to assert that a lot of the basic molecular types which can lead to formation of chains, polymers of different sorts, are quite common wherever there is or has been stellar activity producing the raw elementals. If the building blocks are widely present, then the music they make, the dances they play, are likely to lead to similar types of macromolecules as we find in our biology.**

Not necessarily the same but quite possibly not too different

There may be a vast variety in what leads to reproducible complex organisms that express sentience and ultimately conscious self-aware collective-aware behaviors. Life can Happen in extreme heat, extreme cold, and with chemical baths with wild pH levels or concentrations of elements like arsenic that go against all the “old theories”

We may do well to reconsider Rene Descartes’ claim, “Cogito ergo sum”.

Perhaps it is “Sum ergo cogito” – another possible flipping and turning over the ways we have been taught to think since our day-ones.

Again, this may sound like a Buddhist sutra or something we are “generally inclined” to call “mystical”.

There is no “law” of Nature that says one can discover new and amazing truths (i.e., new ways of looking at things that are strongly consistent and not contradictory) only by quantitative measurement or the generally accepted rules of Aristotelian logic.

Some people discovered (uncovered, just like lifting up a big blanket and finding some treasure beneath) amazing things without a spectroscope or telescope...

How can we explore more, today, from where we are (and for 99.99999%, this means, here on the blue-green film covering this spinning rock)

We can be examining what we already know from what has fallen down from space and those few small things we have begun to collect and retrieve, like samples from our Moon, other planets, and asteroids.

We can also look more deeply at the combinations and syntheses which may have occurred over the past 4 billion years, keeping in mind that concentrations of many organic compounds have significantly changed and, for small “trace” substances, in ways that may simply not be detectable from any examination of physical materials. Such concentrations may be simulated using the computational powers we have now refined and put at our disposal.

The biggest and most difficult task now may be to get enough of the right persons and resources to simply come together and agree on a set of actions - a program of research, a project that very well may be more challenging to undertake than famous others like one in the New Mexico desert and another on a Florida beach. Why may this be so hard? Because it means putting aside a lot of “ego” and also, like for those builders of many temples and cathedrals that required several centuries of hard labor by many, it means working together on something that we will not finish in our lifetimes nor in those of our great-grand-children. It’s not about risk, but about time and being patient.

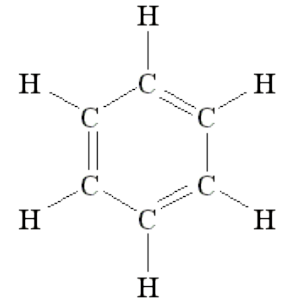


Empirical Investigation and Demonstration

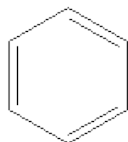
Microtubule Dynamics

Observe changes from exposure at specific resonant frequencies of electromagnetic and acoustic signals.

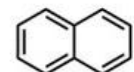
- ◆ **In vitro – microtubules and in situ, within cell cultures**
- ◆ **Controlled background EMF radiation from ambient/general to specific types to “zero” (underground chambers).**
- ◆ **Exposure to combinations of specific resonant acoustic frequencies and specific types of EMF and chemical exposure (the Environment Factor)**
- ◆ **Measurement attention to topological changes – knots, twists, toroids, DAGs, and networks that can demonstrate the memory-retaining capabilities of MT through shape and tensegrity.**



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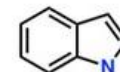
Enter into Space: Beginning with Rings



Naphthalene



Furan



Indole



Pyridine



Tropylium ion



Cyclopentadienyl anion

Incorporate and extend the ASTRIC system model – attention to Asteroids but now not only to avert a cataclysmic collision, but to understand how a range of organic compounds travel in space and reach mixing platforms like Earth.

Three Modes for Experimentation and Data Analytics on a Cosmic Scale

[1]

"Virtual array/cloud of drones"

Collect and analyze data from other sources - mainly telescopes, both on Earth and in space (e.g., Webb, Hubble), for detection of specific classes of organic compounds. A systematic analysis of what can be found or expected on different exoplanets and other bodies, and in interstellar dust clouds, and the prediction of combinations thereof, leading to high probability of living organisms either existing from the evidence or likely to evolve based upon the observed chemistry and the predicted combinations.

Analysis of what combinations of compounds are found together in different interstellar regions and on observable bodies (planets, asteroids, comets). "What combinations are Where and How do they combine."

More than Rings – what they join and produce

[2]

"Actual ASTRIC swarm of drones"

Major objective to have such a fleet sent into space and targeting proximate asteroids/comets. Nothing short of the Full Real Thing.

But this is a massive project and the astrobio component can only be added to such when it is realizable as a launchable system that can be maintained - this means infrastructure and major costs.

[???] Can it be possible to do spectroscopic analysis "in situ" with asteroids that are approached? Micro mass-spec, Raman, other spectroscopy onboard the ASTRIC drones.

Thus the logic to combine mission functions with the original ASTRIC design - Asteroid Reconnaissance, Intervention and Countermeasures to change trajectories and avoid catastrophic impacts on Earth,

[3]

"Analysis of space-origin compounds on Earth"

Obtain compounds collected in space or found on meteorites. Identify. Synthesize. Combine with known organics that occur on Earth. Experiment to determine what can evolve as a result. Try the usual combinations – and try some unexpected ones.

[Original Project Scope] Planetary Defense System for Diverting Asteroids from likely/certain Catastrophic Impact with Earth

Cooperative multi-modal reconfigurable robots + control theory

Avoiding an Extinction Event (certainly for Humans)

§ Original focus mainly on Space and Asteroids – critical needs now

§ Also focused strongly upon Earth and Climate applications (“EMME”)

§ Offers robust commercial, social and cultural benefits along with long-term high-visibility purposes and functions

§ Makes use of CubeSats (involving Students at multiple education levels) for a variety of data acquisition and simulation tasks

§ Produces value-outputs for other businesses (agriculture, social media networks, the mining industry)

§ Cultivates entrepreneurial and joint venture Tech Business Development attracting multinational commercial & financial partners

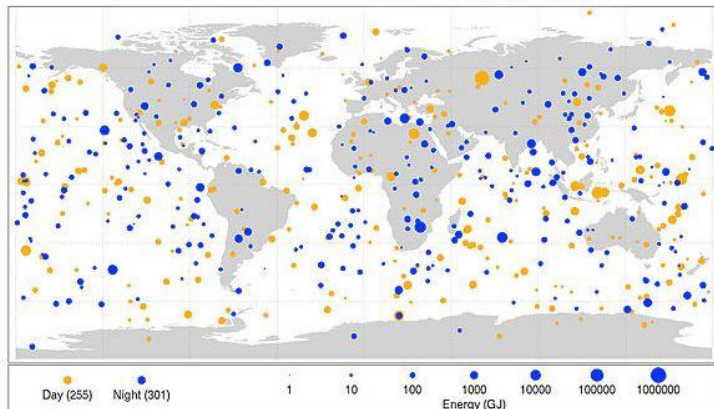
§ Extends machine intelligence into cooperative networks of self-reconfigurable, self-repair, self-assembly teams and communities of robots (“drones”)

We can rework ASTRIC to serve AstroBio and the study of molecular species in space and in objects that have or could have impacted Earth and similar planets leading to emergence of Life. Combine Objectives and Goals. **Get Practical.**



Bolide events 1994-2013

(Small asteroids that disintegrated in the Earth's atmosphere)



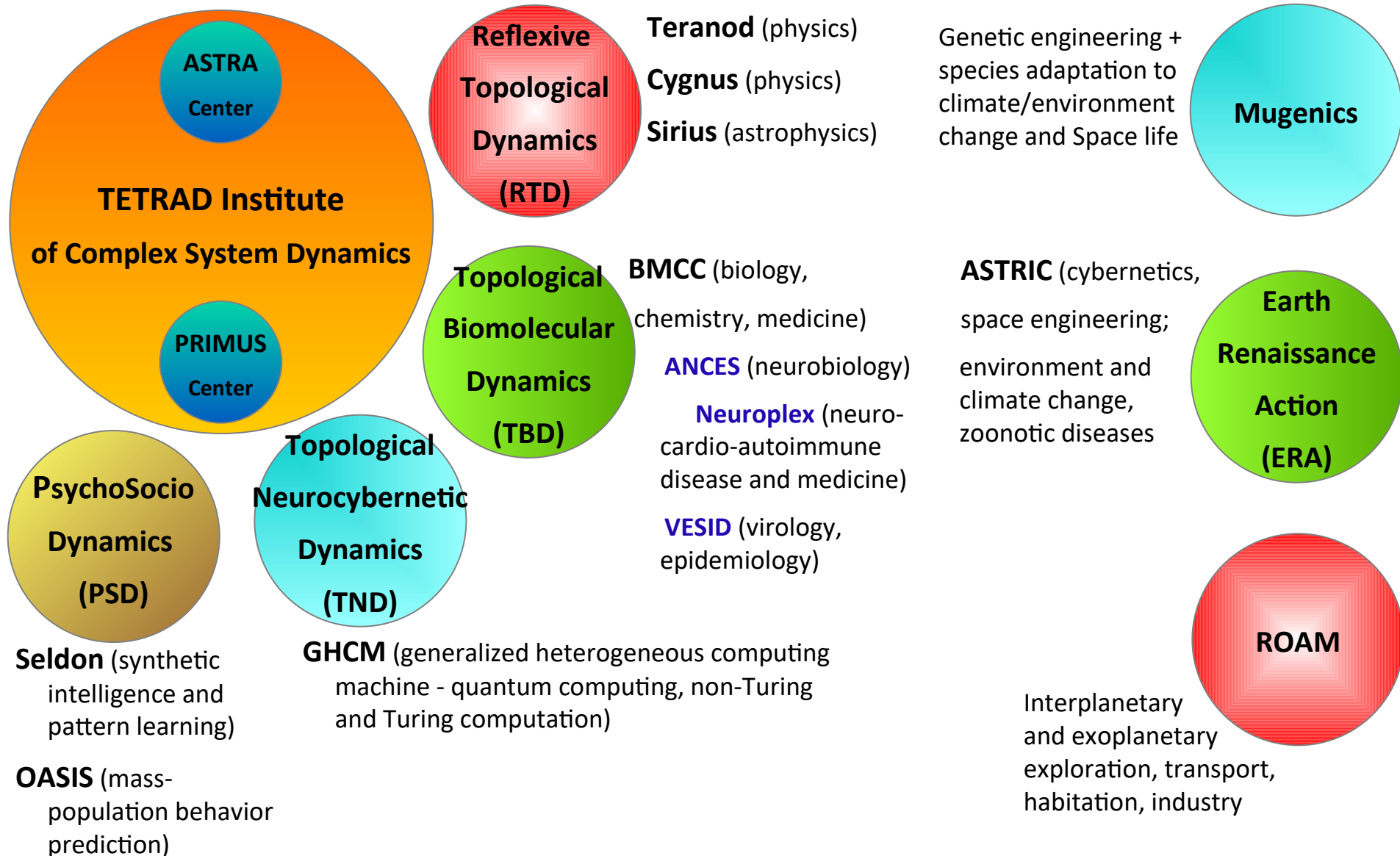
Frequency of small asteroids roughly 1 to 20 meters in diameter impacting Earth's atmosphere.





Recapitulation and Moving Forward

Some of the priors and concurrents that have led to all this and what we look forward to doing More... and More...



All this geometry and topology in the biomolecular space

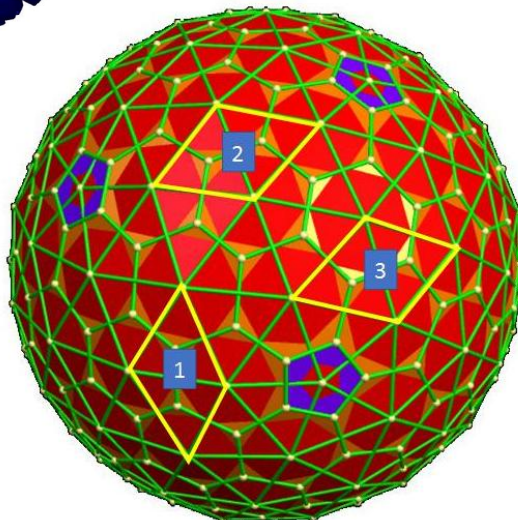
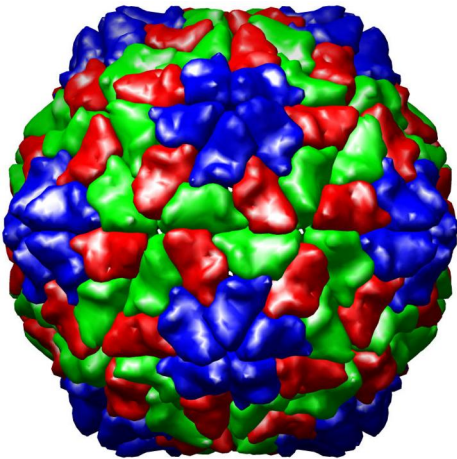
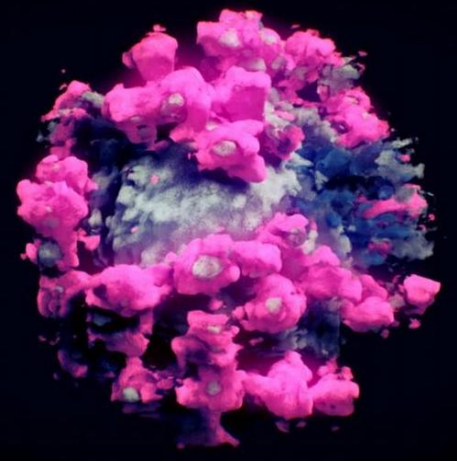
also offers a number of practical Medical and Public Health value prospects

Over and beyond the incredible exciting (R)Evolution in how we

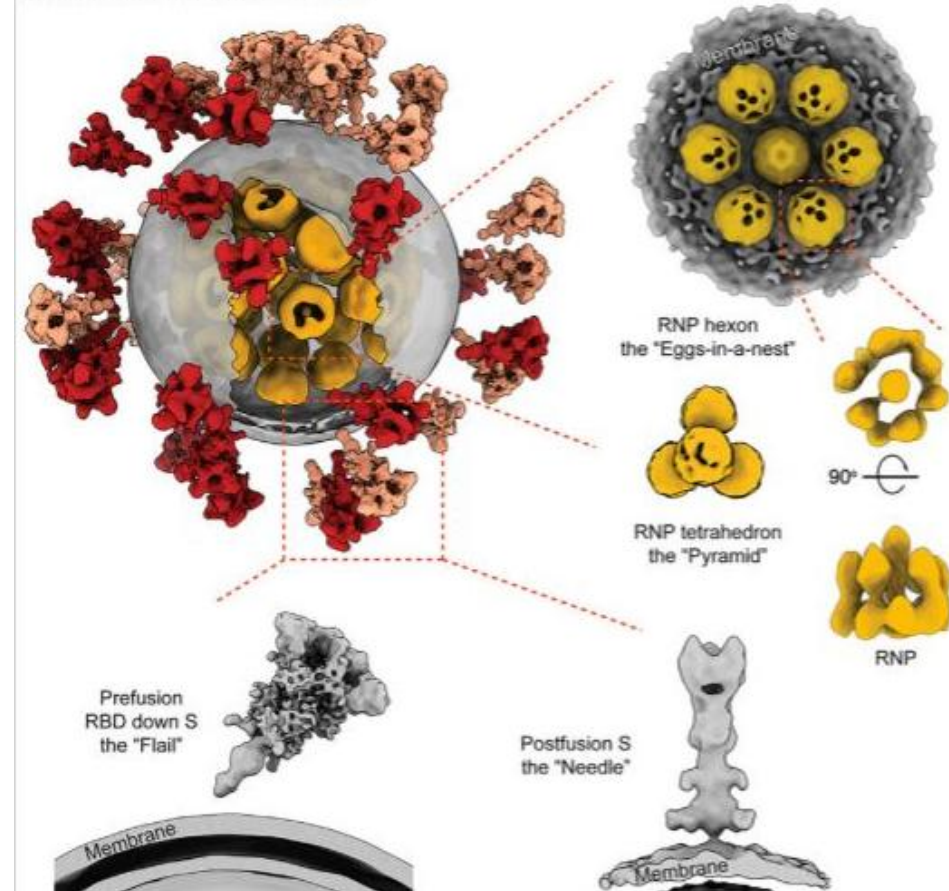
Think and Feel about Universe, Life, Consciousness, Ourselves, Each Other

VESID is just one example. VESID = Viral Entry Structural Integrity Disruption

Another approach to combating pandemics like COVID-19.



the authentic SARS-CoV-2 virus



Neuroplex =

A theoretical-diagnostic-therapeutic approach to

Neuro-Cardio-Autoimmune-Inflammatory Disorders and Diseases – on the Rise Globally from Chronic Sustained Stressors both physical and psychosocial in their origins

Addressing causal agents not generally recognized in mainstream medicine and healthcare systems, including abuse and addiction

Avoiding Deterioration of Individual Lives and Society as a Whole

PHIBER =

Population Health Informatics Biomedical Equity Resource

Required to Progress in areas of multiple diseases including Maternal and Infant Health and Survivability Worldwide

There is a concrete Clinical Outcomes Benefit that we need in our present Socioeconomic World

It is attainable through therapies with novel, simple, easy, economical technologies – notably: Ultrasonics, Microcurrents, Magnetics, and other BioEMF, combined with Nature Therapies

Our Bodies are Instinctively Self-Healing – if we don't block what is built-in to our design!

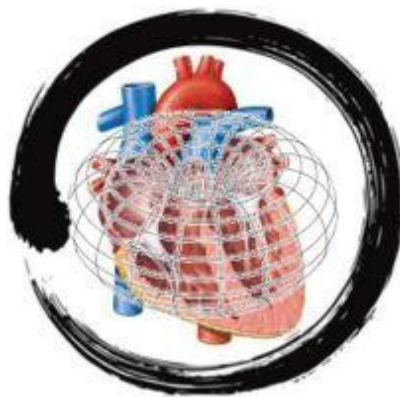
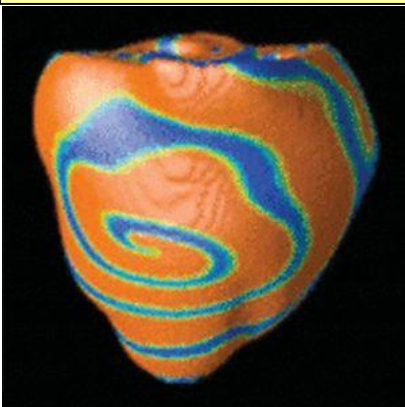
Consider:

External and internal Stressor Agents (multiple)

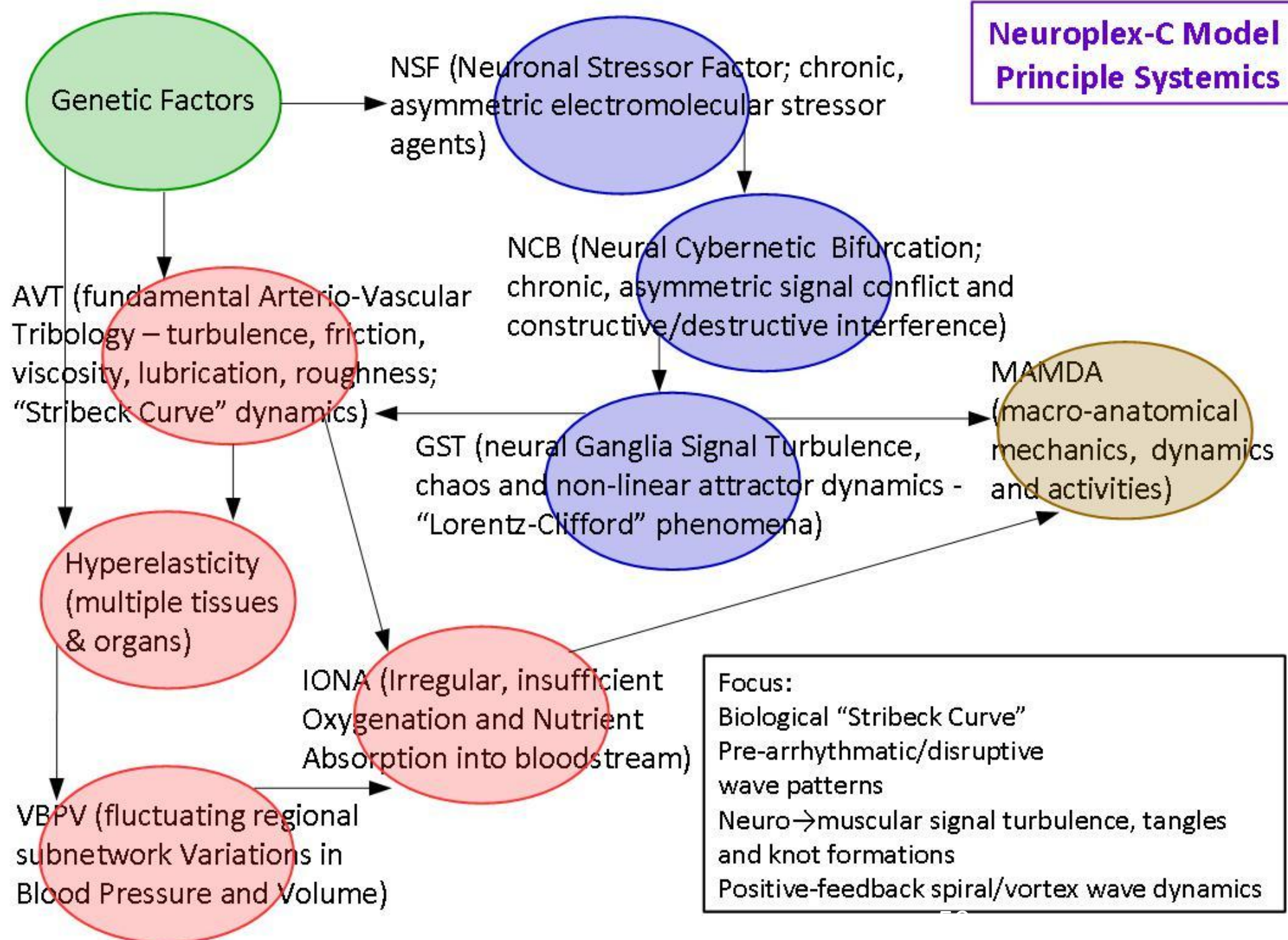
Disruption of Micxrotubule Harmonics

Disruption and Distortion of Biosoliton Energy Transfer

Inflammatory, Arrhythmic, Dysautonomic Behaviors



Neuroplex-C Model Principle Systemics



Neuroplex-C Model

Chronic Stressors leading to Inflammatory and Autoimmune type (IAI) Processes [2]

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ANCES - Autonomic Neurophysiological Control and Electrochemical Stress

NCB (Neural Cybernetic Bifurcation; chronic, asymmetric signal conflict and constructive/destructive interference)

MAMDA (macro-anatomical mechanics, dynamics and activities)

GST (neural Ganglia Signal Turbulence, chaos and non-linear attractor dynamics; "Lorentz-Clifford" phenomena)

Adhesions and other connective tissue aberrations (+ and – growth effects)  
- a major common element in these slow-evolving conditions

AVT (fundamental Arterio-Vascular Tribology – turbulence, friction, viscosity, lubrication, roughness; "Stribeck Curve" dynamics)

Hyperelasticity (multiple tissues & organs)

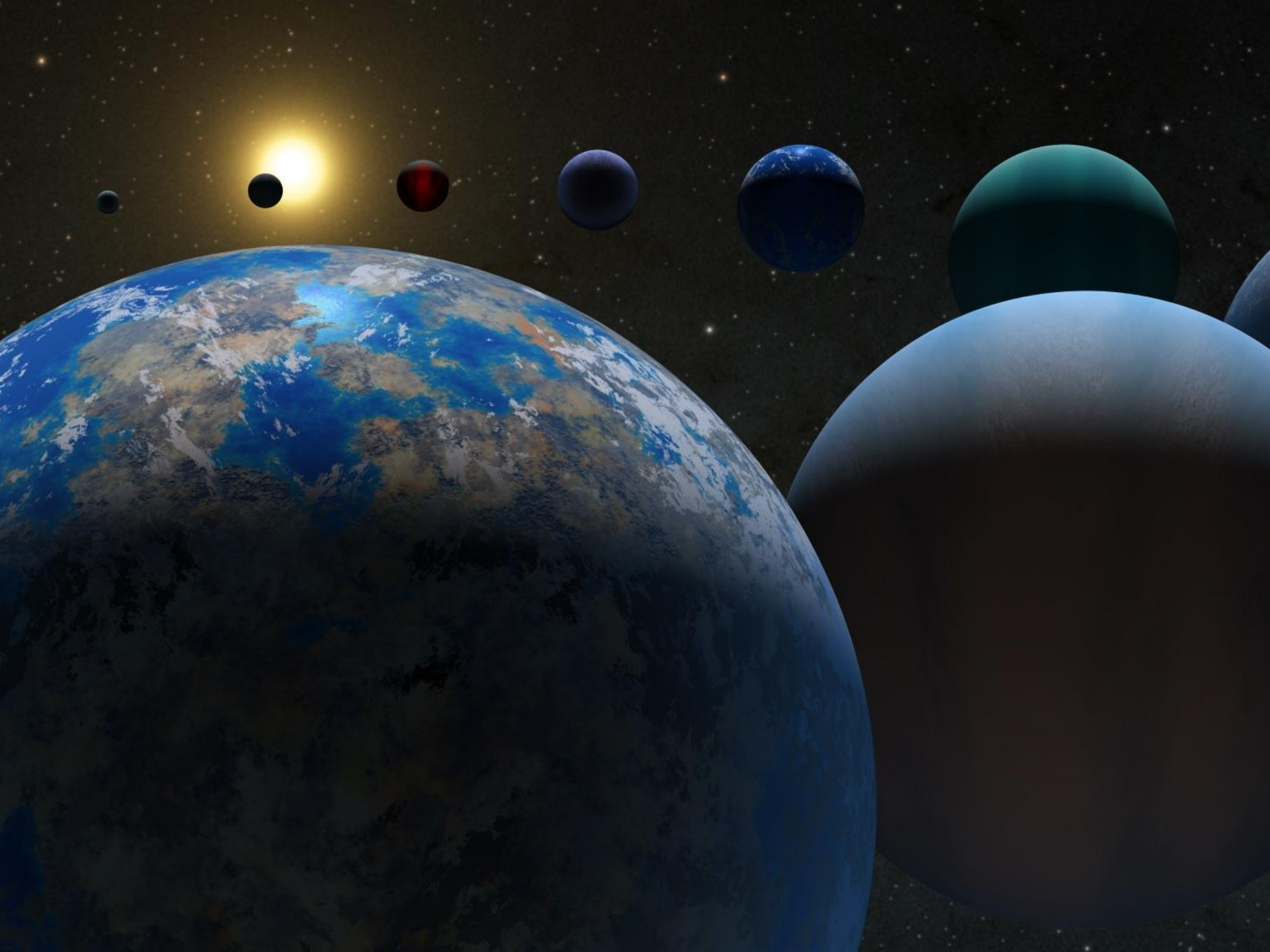
IONA (Irregular, insufficient Oxygenation and Nutrient Absorption into bloodstream)

VBPV (fluctuating regional subnetwork Variations in Blood Pressure and Volume)



If we stop short-circuiting ourselves with energy-negating stressors, we will not only live longer and be more productive and creative but we will have incredible vigour and stamina and give Pleasure to those around us. That's the whole point of Life, isn't it?







## Remember Who We Are

Where We Live – on a speck of dust circling a dot

We have learned to stand, walk and talk

We have sent a Message to the Heavens saying in a  
loud clear voice: “Here We Are”

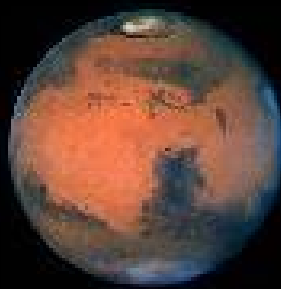
Have we in fact sent a message Home?

Are we those Extraterrestrials we seek?









**EXO**



**We Are Already On Our Way  
HOME**

## Contact:

Martin Joseph Dudziak

+1 (231) 492-8301

+1 (505) 926-1399

+1 (716) 226-6192

[contact@tdyn.org](mailto:contact@tdyn.org)

[info@intelrenaissance.com](mailto:info@intelrenaissance.com)

[martin.dudziak@gmail.com](mailto:martin.dudziak@gmail.com)

[martinjoseph@tdyn.org](mailto:martinjoseph@tdyn.org)