

Life-Form A Matters-Syncytium: DeepScience for Matter Correlates of Conscious States

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Abstract

It is all material at observable plane. Living state could be understood as a multidimensional syncytium of several matter-states cohabitating in an extraordinarily unique and sustainable manner that grows and evolves as systems with emergence of cognitive and decision-making ability reflected in homeorrhetic far from equilibrium behaviour. "Life-form", within a porous enclosure by cell wall/membrane, stands at the centre of the spectrum between ordinary and exotic states of matter. As in neuroscience one looks for neural correlates/correspondences of conscious states (NCC), similarly it is possible to find out matter correlates/correspondence of conscious states (MCC). The perspective developed in this paper calls for a DeepScience to show how the essence of the material science is interconnected with the essence of the Multiversity along the sub-quantum and sub-subquantum recess of nature involving presently non-observable several exotic states of matter; dark matter, neutrinos, operations of information-states, operations of cognitive faculty such as mind, self, life-principle and consciousness. Investigation of this interdisciplinary terrain has translational value for next three century's science.

Keywords: *Matters-Syncytium; Living State of Matter; Matter-Correlates of Psyche; Matter-Correlates of Conscious States; DeepScience*

Introduction

A kind of pan-materialism is the substance of this paper. It is all material at observable plane. Even emotion like love is seen to be mediated by physical matter both in small (neurotransmitters in the brain) and large scale (for example, matter web in the universe). There are molecules of emotion [1]. On the basis of such substrate of matters two concepts have been build up in this paper; multidimensional syncytium of matters for living state, and matter-correlates/correspondences of consciousness. These two concepts are bridged by another important concept of DeepScience. Life-form is suggested to be a multidimensional matters-syncytium in an extraordinary and unique combinatorial cohabitating state. One day the science is expected to formulate correlates of consciousness at the pure material level! This paper stimulates the readers to travel frontline from the age-old views on matter-mind relationship, which has been generally described on the basis of substance dualism (Rene Descartes), or as external and internal world (accomplished spiritualists across the religions), or, at best, as two sides of the same coin (Spinoza)! In all such views, pan-materialism and panpsychism are mutually exclusive. Inside never becomes out and outside never in! Two sides of the coin never meet and standing back to back look oppositely ad infinitum. Two substances remain two, distinctly forever! There is no room for "life" in all such views. Once "life" is brought at the centre of the spectrum, a different framework for science emerges. Through 'life' as matters-syncytium standing at the centre, the matter-mind continuum moves from the gross states of matter towards exotic subtle states making transition of tangible into intangible possible. The proposition opens the scope for a science which is deep, involves deeper recess of nature where there is fusion of ontology and epistemology, axiology and phenomenology, and in which tangled are some exotic matters, various information-states as currency of several non-observable abstract operations, and the operations of cognitive faculty including principles of life. We will develop this perspective, first by describing the known states of matter, both common and exotic, followed by a transition

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towards informed and organizational states of matter, and next elaborate on the proposed living state of matter. This will be followed by a direction on requirement of a DeepScience, which might inspire many of us to investigate the intellectually comprehensible Infinity as the Multiversity and the matter-correlates/correspondences of conscious states. The perception created of DeepScience is dynamically non-linear, hierarchically structured and multidimensional, where processes although run in a labyrinthine way, the processes and processors are structurally and functionally rooted in consciousness.

Known States of Matter

Matters are all which occupy space and have mass. The state/phase of matter is physically distinct and uniform throughout and is chemically unique as well. Commonly there are four states of matter; solid, liquid, gas and ionic state. Besides the above-mentioned four state/phase of matter, there are about fourteen exotic states/phases of matter! Exotic matter behaves as one atom full of atoms (quantum indistinguishability), has negative mass, does not obey laws of gravity, accelerates in the direction opposite of applied force, and mostly operates in non-observable plane.

There are eight exotic states of matter, which are found at very low temperature. For example, Bose-Einstein Condensate (BEC) is a superfluid phase of matter (zero viscosity) with Bosonic particles. Fermionic condensate is a superfluid phase formed out of fermionic particles at low temperature. Liquid helium must be cooled to extremely low temperatures for such properties to emerge. Superfluid-quasicrystal in BEC makes another state of matter. Supersolid is a special quantum state of matter where particles form a rigid, spatially ordered structure, but also flow with zero viscosity. A BEC trapped by laser is one of the methods to create a supersolid [2-4]. We are not aware whether it can happen naturally or not! Superconductor state (commonly exists in 90° Kelvin), which although is often treated as solid state, is qualitatively very different from solid, and shows zero electrical resistance and expulsion of magnetic fields. New competing state of matter in superconducting material has been uncovered [5]. Hole-y Superconductor recently described is claimed to be an entirely new state of matter [6].

Three exotic states of matter have been found at very high energy state; Plasma state (seen in sun and other stars), Quark-Gluon Plasma (in which quarks become free and able to move independently) and Degenerate state of matter with high kinetic energy to satisfy the Pauli's exclusion principle. Examples of Degenerate state are Neutron-degenerate (found in neutron stars) and, Electron-degenerate matter etc.

Three exotic states of matter show magnetic properties, also called magnetic analogue; namely, spin liquid, paramagnetic, and magnetically ordered phases obtained by unbiased quantum Monte Carlo simulations [7]. Figure 1 shows some of the pictures of exotic states of matter:

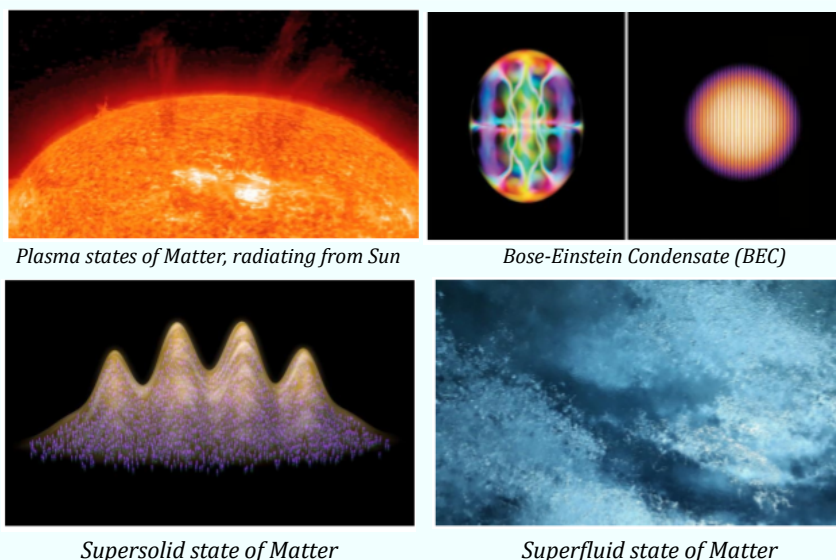


Figure 1: The pictures of four exotic matter states. The pictures have been taken from non-copy-righted Goggle images.

New states of matter are also uncovered and claimed quite frequently. Many of them have their specific use as sensor in engineering, in robotics, quantum computing etc. Some of the matter-states intermingle with information. However, which all matter-states could carry information with them and could be called informed state of matter is required to be examined. Similarly which all matter-states alone or in combination (e.g., as alloy or amalgam) possess obvious sustainable organizational ability is also an area to be explored. We are also baffled with so many exotic states of matter especially at very low temperature! Why are they there? What do they do? Nobel Prize of the year 2016 in Physics has been awarded “for theoretical discoveries of topological phase transitions and topological phases of matter!”

Transition towards Organization

In a move towards achieving functional state there are two phases of matter which show organizational ability; informed state of matter and the matter in self-organizing state.

A. Informed states of Matter

Not all states of matter could be a vehicle of information. At quantum level John Bell observed two kinds of particle, be-able and not-be-able. Perhaps, the be-able particles have the capacity to carry information and therefore have causal property. This ability is not observed in not-be-able quantum particles. In fact, quantum puzzles and paradoxes could be explained better by vehicular transport of information by a few quantum particles. A new state of matter, topological superconductor with phase signature of topological transition in JJ (Josephson Junction) has recently been reported [8] which could be useful in faster quantum computing and data storage. Whether even this state could be called informed state of matter is a debatable issue. Very recently, in simulated sonic blackhole [9] it has been shown that with disappearance of blackhole, information also disappears. The observation contradicts the dictum of quantum mechanics that there cannot be any loss of information in this universe. The paradox points towards two additional possibilities. First, quantum mechanics does not explain the whole of the universe. The black hole of a dying star is a constituent of the universe but not the whole of the universe! Second, information has an independent existence beyond quantum scale of nature, at its sub-quantum nest.

At the classical macroscopic level we wish to draw attention towards some chemical bio-molecules, which could be called informed state of matter. Several of biological molecules could never be called ‘informed’, such as molecules of urea, sugar, uric acid or albumin and even ions and gases. Even the colloidal state of matter may not be in informed state. On the other hand, there are molecules which because of their configurational changes could carry information with them. How a non-informed molecule becomes informed molecule following configurational change is a fertile terrain for research in material science.

Informed biomolecules form two major groups. The first group consists of proteins having secondary (e.g., receptor proteins), tertiary (e.g., enzymes), quaternary (e.g., DNA-repairing enzymes) and spherical (e.g., nuclear histone around which DNA strands coil) structure. Proteins with primary structure are not usually informed. They can act best as signal. The second group consists of nucleic acid, RNAs and DNAs. Since information by nature is intentional, these are highly organized matters, which exhibit intention and causal property. At the developmental phase of our universe there were also RNA/DNA-world, and Protein-world. Of the two, which one had appeared first is like chicken-first or egg-first issue!

B. Matter in Self-organizing state

In this state of matter, there is spontaneous pattern formation from an initial disorder state. “Self-organization is creation without a creator attending to details” [10]. The operation works on specific logic resulting in pattern formation, often pattern within pattern and that within same pattern on finite truth table that indicates a holonomic process for structure development. Self-organizing structures are seen in large scale (universe, galaxy, star, organization of tectonic plates, iceberg etc.) as well as in small scale systems (crystallization, water lattice, fractals etc.). Limited self-organization is seen during crystallization, even during formation of colloid crystals. We are aware of self-organization of water lattice at the interface of two matters, which often has been described to have biological value. In contrast to some chemical matters which have been shown to work on limited basis during self-organizing and pattern formation, Ghosh, *et al.* have reported an organic jelly [11] making fractal logic gate with an infinite truth table. However, the limitation of a self-

organizing crystal or a fractal is that they cannot replicate by choice. Self-organization process in living states achieves higher order perfection. For example, self-organization of organs and systems during embryonic development and regeneration of injured tissue and healing of a wound occur with remarkable accuracy and precision.

Both informed state and self-organizing state bring some special ability in matter to organize itself. Information adds intention in, and what is called self contributes logic for organization. However, both intention and logic are aggressive in character, 'masculine' in nature. Such state of matter works with digital information. Based on this property, several matters in their special state are used as a 'sensor' for signal or digital information. Several proteins and other matters have also been reported to act as sensor within a biological cell [12,13].

None of these two states of matter, however, has the ability to respond to non-digital information. We have recently come across a matter-state probably with such properties as in acellular slime mould [14], which has become a new starting point of investigating cognitive properties in matter state.

C. Living state of Matter

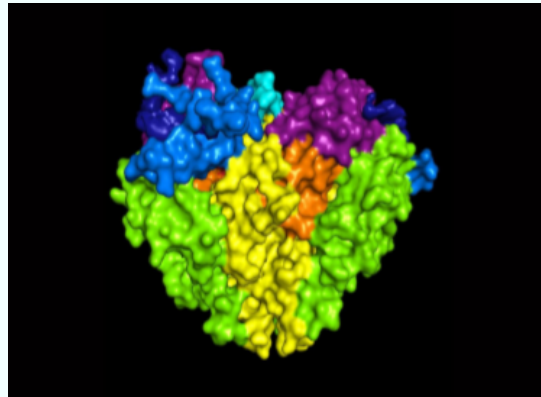
Life is understood differently by scientists, philosophers and spiritualists. For Aristotle life was an animation, for Descartes a mechanism, for Kant an organization, for Darwin variation and evolution, for Whitehead a process, for Weber life is an emergent complex system and for Dawkins an epiphenomenal gene vehicle! For the accomplished spiritualist, life means life-principle. For a biologist life is a life-form, life enclosed within a membrane/wall with a characteristic space time energy and information dynamics. For a materialist, life is "orderly and lawful matter based partly on existing order that is kept up" [15]. For a scientist adapted to an advanced self-organizing paradigm, life means the living state of matter [16].

With the lead of Ilya Prigogine and Brian Josephson, in association with R. K. Mishra of All India Institute of Medical Sciences, at least three international conferences on Living state were organised in India, first in Delhi (1981), second in Bhopal (1983) and the third in Shillong (1985), none of which's trace could be found in the internet web. However, Sungchul ji, a Korean scientist in Rutgers University kept on working in the field, and refined the "Bhopalator" model [17] of living state for computational cell biology, which he calls C-model (C for cell) in contrast to existing H-model and P-model, and recently authored a book on cell language connecting mind and matter [18]. In annual review of condensed matter physics, 2011, there is a relevant review article, "Life is Physics: Evolution as a collective phenomenon far from equilibrium" [19]. The focus of the review is on evolution seen as a problem in non-equilibrium statistical mechanics which couples ecology and mobile genetic elements within a collective dynamics. Twenty seventh Solvay conference in 2017 was on the physics of living matter, the proceedings of which is likely to come out in May 2020. Independent of outcomes of such conferences, the ideas and views of the author on this issue are stated as follows.

It is in the living state, the matter becomes truly a 'probability machine' with event horizon at the level of critical instability. Besides information handling and self-organising ability there is a new value addition in such living state of matter, that is to have the sense of feelings, to behave as a sensor for non-digital information! Receptor for digital information has been identified in living cell and could be synthesized in vitro, but the receiving mechanism for non-digital information is yet to be deciphered. In living state some proteins of quaternary structure have been found to develop censoring property asserting which it can deny a signal to act on it. Probably because of having such a life-organized systems the acellular slime mould, *Physarum polycephalum* [14] can take decision and redefine itself. Unless it can feel and experience, how can it do so? This ability is beyond the scope of signal operated devices. In contrast to masculine nature of informed state and self-organizing states of matter, which work on digital information, this unique character of sensitivity and response to non-digital information is 'feminine' in nature with value-addition in such a specialised state of live matter manifested in the behaviour of acellular slime mould as a very rudimentary form of creativity!

Living state as Matters-syncytium has following properties

1. Life-form is an extraordinary, very specific, unique combinatorial cohabitation of several states of matter behaving as a multidimensional syncytium. It is a syncytium of several matter-states. Figure 2 shows the imaginary possible structural biology made of multidimensional matters-syncytium



Structural Biology: Of multidimensional Matters-Syncytium

Figure 2: *The imaginary structure of multidimensional matters-syncytium. The picture has been taken from non-copy-righted Goggle images. Though the actual image shown is three dimensional, adding on exotic matters over it would make it multidimensional.*

Syncytium in biology is known as generally organized cohabitation of thousands of similar cells with protoplasmic continuity. Protoplasm is a state of matter too. Living state is a syncytium of different states of matters, which behaves as live with unity property. Here pluralism exists without compromise on individualism. Individualism exists without compromise with systems unity. As constituents of this syncytium, there are solids, liquids, gases, and ionic states of matter. Two informational states of matter (cosmologically came from DNA /RNA-world and protein-world) are functionally connected in this platform of live-matter. The dissipative state of photon and phonon within the living state represents the photonic state of matter. Self-organizing water lattice at the interface of matters is also observed in living state. The fourth phase of structured water at liquid crystalline phase [20], which is observed in addition to its known solid, liquid and vapour phase, is also abundant in the living state.

2. This, however, could happen only within an enclosure known as cell wall/membrane formed also by almost similar matter-states. Living state of matter cannot be an indefinitely diffuse state without any boundary! This matters-syncytium will have to be bounded in a space time framework for a defined purpose.
3. In spite of having been bounded, this combinatorial cohabitated state of matter, however, is open to energy, matter, information and some other subtle matter elements (e.g., neutrino and matter web) of this universe. In functioning of cellular automaton, there is no logical closure too! This enclosure brings a sense of difference between the self of matters-state and other (environment). As suggested by Kompanichenko [21] there occurs an inversion of the universal processes inside life-form. This is its boundary through which macro-cosmos of outside becomes in, and micro-cosmos of inside becomes out (cf., Goethean phenomenology) without any existential problem.
4. As we observe in systems cell, the living state of matter has acquired systems properties [22]. It is important to mention here that Cell press has started a new journal *Cell Systems* since 2015. In this enormous complexity, there are hierarchy of intercommunicating processes with *automation* of perfected tasks (e.g., signal network, molecular robots) which are supervised and managed from deeper within by operational mechanics of some non-observable *autonomous* processes. Because of this in-built systems mechanism within the cell, the response from a cellular matter is always holistic as well as solution-centric.
5. Out of such combination of different matter-states the new property which emerges is the ability to run homeostasis of the whole system resulting in a “homeorrhetic plastic flexible equilibrium” [23] on the face of challenging external and internal signals. “In animate, matter and energy remain bound by the wide scope of thermodynamics concerned with dissipative processes primarily related to sinks of non-conservative fields. On the contrary, life as a system is based on sources of various non-conservative fields. Living organisms are characterized by tapping the sources of non-conservative fields in a higher rate than by directing their energy

into sinks" [24]. Therefore, besides metabolic homeostasis (of sugar, hormones, ions, pH and gases etc.), three subtler homeorhetic properties [25] have emerged in living state; uncertainty-certainty homeostasis, asymmetry-symmetry homeostasis and dark (invisible) energy-visible energy homeostasis. Ordinary matter state, alone or in combination operates with certainty. However, this live matters-syncytium has the ability, although limited, to manage uncertainty within and in the environment. Ordinary matter state, alone or in combination is prone to symmetry breaking processes. In the living state, the matters-syncytium can manage, although to a limited extent, disturbance created by symmetry-breaking processes and get involved in symmetry-making processes within and outside its boundary. Ordinary matter state, alone or in combination operates with visible energy. In live state, the matters-syncytium is far from equilibrium and interacts with visible energy, invisible dark energy and even invisible dark matter! Dark energy has been construed in human brain [26]. In no other state of matter, this kind of ability in homeostasis has been observed yet.

Matters-syncytium provokes Science with more questions

1. How automation (molecular signalling and molecular robots) and autonomy (because of cognitive and decision making ability) remain connected within the systems of matters-syncytium? Could this connection be linked with development of ability to act as sensor for non-digital information? Could this connection have something to do with phase transition from conventional matters to exotic matter? Nothing is known!
2. How homeostatic and homeorhetic properties emerge in the living state? How this might be linked with development of ability to censor some of the received and perceived signals and information, digital and non-digital?
3. Whether there exists any unifying principle to bring all such pluralism and activities characteristic of living state under one umbrella of unified systems? What are we still missing which is hidden in the two words, syncytium and cohabitation? Is this unifying principle that what has been called *élan vital* by Henri Bergson [27], life-principle in *Vedantic* tradition. and principles of life in modern science [28]? Ervin Bauer suggests [29] that the intangible aspect of life, its irreducible element is life principle, -an inescapable assumption for life-science. This principle cannot be, and does not need to be produced in the laboratory. It is abundant and inexhaustible in nature. Life-principle included within matters-syncytium in a specifically informed situation creates a viable space-time-energy-information framework for activities of the life-form. Water has been recognised as an active matrix of live cell [30]. So also is for the informed states of matter within protoplasm (proteins) or nucleoplasm (DNA)! The new science of water has been emerging with demonstration of memory of water molecules in special circumstances [31]. What could be the exotic matter states [32] that directly bear the footprints of such life-principle? We are trying to look for real of the virtual of the virtual of the virtual! Matters exist in exotic state at the border between solid liquid and gas! Topological phase transition could take place in thin film of matter! Is there any role of this thin film in such unification?
4. From where the survival instinct appears in such living state of matter? Even the free-living single-cell organism, such as bacteria or protists learns! It accommodates with changing environment, locates food substance and objects of love, and escapes from predators [33].
5. Without having a brain or without being a nerve cell, how an acellular slime mould, *Physarum polycephalum* behaves as "brainless but multiheaded" and makes decision [14], how a slime mould and unicellular ciliate can integrate complex spatial information [34], how a complex hierarchy of decision-making avoidance behaviours emerge in a single-cell eukaryote, *Stentor roeseli* [35]? How such complex specific combinatorial alliance of several matter-states can explain emergence of cognitive property such as learning, and taking decision etc.?

There are evidence of relationship of life-form with extremes of temperature. It is said that life-form has been originated in a situation of hydrothermal vent at the floor of the deep sea, where the temperature is around 400°C (750°F), where water does not boil due to high hydrostatic pressure. (Compare, temperature of plasma state is around 1100⁰—1400⁰F). Primitive life-form also remains live in freezing cold at Antarctic and Arctic temperature (-80°C, -50°C). Five thousand year old "ice man" preserved in the European Alps glacier, has also been found in 1991. DNAs of fossil could be made active. However, nothing is known of the relationship between 'life' as subtle as life-principle and exotic matter-states at sub-zero or high temperature.

Living state of matter is not an island, not a stand-alone entity in the universe. Two events cross my mind. In spite of having eighteen states of matter as described, neutrinos remain as one of the eighteen biggest unsolved mysteries [36] in physics. Every second almost

100 trillion neutrinos pass through our body without interacting with any of the particles there. Still neutrinos are essential for life. “We would not be alive without supernova - most certainly supernovas are the best source of neutrinos”, says Mark Vagins [37]. How neutrinos are related to living state of matter is still unknown! Also unknown how cosmic web of matter spanning all over the universe [38] is entangled with the living state of matter!

DeepScience

We have stated what is known of eighteen different states of matter. We have stated what is also known such as informed-, and self-organizing states of matter, about web of matter and neutrinos. We have elaborated on what is not known or to be known. Living state of matter has been construed not as a single state of matter but as a specific combinatorial cohabitated syncytium of several states of matters which is sustainable, exhibits systems properties, homeorrhetic properties and cognitive properties for which it can adapt with environment, grow and evolve. How this proposition works helpful for Artificial Life (AL), synthetic biology, robotic intelligence and quantum computing is to be watched.

What is DeepScience?

“There are no scoops in science, only a slow construction of truth,”....“Discoveries are very rarely made in one shot”, says Sébastien Balibar. “Science advances through tentative answers to a series of more and more subtle questions which reach deeper and deeper into the essence of natural phenomena” (Louis Pasteur). To continue construction in science for such deep phenomena, we require a Deep Science, especially to understand the results of operations (which is often dumped for psyche!) happening at presently non-observable plane. There are subtle matters even at observable level. At presently non-observable nests of nature there are some exotic matters, dark matter, neutrinos, dark energy, several information-states (Figure 3), some definable operations of cognitive faculty including the principles of life.

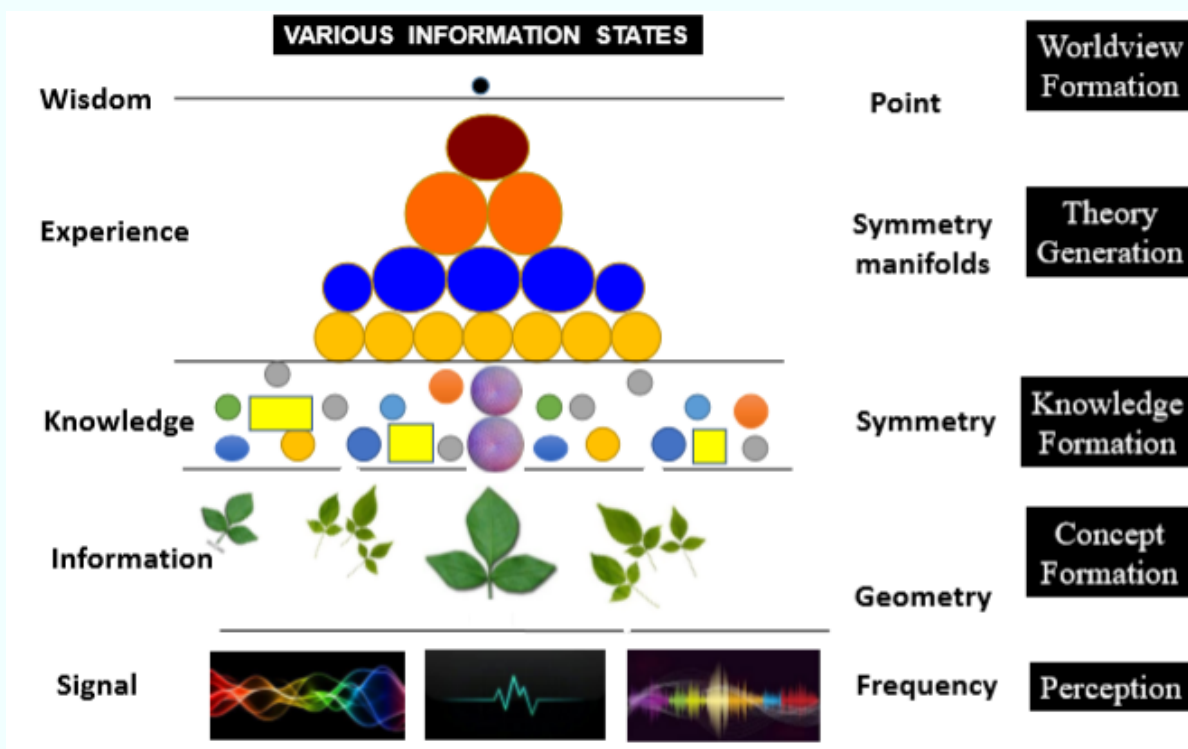


Figure 3: This shows various Information States from the level of signal at the observable nest of nature to the level of wisdom at the level of the event horizon at the border zone of our universe/cerebral cortex. At the observable nest of nature, information is in space time format as signal. In sub-quantum nest of nature information has trifoliate structure. Packaging of such information matters. They are packed in different size boxes and also within different sized spheres. The spherically packed information represents knowledge. In the sub-subquantum nest there are information-manifolds representing experience. In the deeper recess of nature, the spheres get reduced to a point as wisdom, which resides at the border of nature and consciousness.

Locality and Reality are said to be inconsistent with quantum mechanics. According to some interpreters of QM, true nonlocality is beyond the realm where quantum mechanics is applicable. In contrast, the cognitive faculty by nature are nonlocal, are not and cannot be localised in space and in time.

Present physics puts the Reality of 'Infinity' under the carpet and remains confined to quantum physics, death of stars and black holes. DeepScience takes the risk of leaving quantum mechanics, death phenomenon of star and black hole behind, looks beyond the quantum scale of nature. DeepScience, tries "engineering vacuum" [39] of interstellar and intergalactic space, continues investigation across the zero-point energy state in quest of 'life' and Infinity!

DeepScience is to account for the virtual of the virtual of the virtual of the sensible real observable matter. Deep Technology is harnessing those virtual in the real observable world.

I am reminded of a comment of Sir Winston Churchill expressed wittfully on Russian foreign policy, "It is a riddle wrapped in a mystery inside an enigma". The terrain for DeepScience across the zero-point energy state is much more complex than this! In such deep recess of nature, one finds fusion of ontology and epistemology (operator and operation) in one hand and axiology and phenomenology on the other hand where phenomena are axiomatic and axioms are phenomenal. Churchill's second part of the comment in the same context holds the answer, "But there is a key: Self-interest"! It is in the interest of science, this terrain deserves exploration. Steve W Cranford, the editor of journal *Matter* (cell press) writes, "People have been turning to nature for inspiration to help them solve problems for millennia. From a materials perspective, this typically includes either (1) stealing ideas from nature via biomimicry or bioinspired materials or (2) interacting with nature to engineer biomaterials for biological and/or medical applications". However, the approach to this perspective remains gravely fractured and seriously handicapped and therefore incomplete till the knowledge of the deeper recess of nature does not accumulate. What is the relationship between matter and life? What is really *biomimicry*? What are all *bioinspired materials*? What are the *biomaterials* the science wants to engineer from nature? Therefore, for the sake of interest of science the idea of DeepScience may be pursued. The author has a published figure relating life with dark matter dark energy, visible matter and visible energy. The figure is reproduced below (Figure 4).

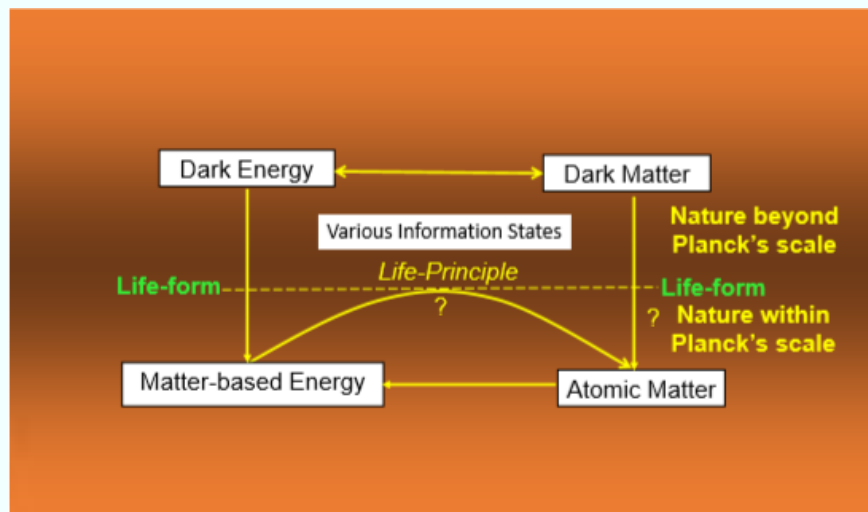


Figure 4: Within the Planck's scale of nature, conversion of matter into energy happens according to equation $e=mc^2$. There is no clue whether energy is converted into matter within Planck's scale of nature. In the nature beyond Planck's scale, there happens in all probability interconversion of dark matter and dark energy to keep respectively the contraction and expansion of the universe in balance. Life-form stands at the border between nature within and nature beyond Planck's scale and is responsible for engineering dark energy into visible energy and vice versa. Various information states are involved in the process too.

Also, mark the word “self” in self-interest in the remark of Churchill. All investigators across the disciplines of science work with their instruments of mind and intellect which are governed by their self! Even if science considers self as an agency, it can be identified with its specific operation, thus making the issue of presence or absence of any agency redundant. Operation of self is involved in formatting several related information into knowledge systems having an invariant symmetry. While one or more such non-observable agencies exist for the sake of description, the effects of their operation are observed in behaviour like perception, cognition, intention, learning and decision-making, making will and volition etc. The inviolable axiom followed by the operation of self, and the profound phenomenology created by this operation of self are indistinguishable! The DeepScience of such underlying operations is co-tangled with different hierarchical forms of information-states ranging from signal to digital information, non-digital semantic information, Gödelian information of the whole (non-factorizable), information-manifold and information crystal [40]. Immediate spin-off from DeepScience is opening up the door for investigation of relationship between some exotic states of matter and information.

The Question that guides us in DeepScience: What is at the Depth?

The question which guides us in DeepScience is what is at the Depth?, *Unde venis quantum mechanics?* This question was originally raised by Gerard 't Hooft [41] in 2002 in a conference on *Quo vadis Quantum Mechanics*, held at the Centre for Frontier Science at Temple university, Philadelphia, USA (published in 2005) and the idea subsequently carried forward by Blasone and Jizba, who speculatively justify the view that the underlying structure of quantum mechanics can be formulated with the help of a cellular automata [42]. Hooft himself has developed the idea further in his 2016 publication, *The cellular Automaton Interpretation of Quantum Mechanics* [43].

At this stage, I wish to remind the readers of a much celebrated vision of Louis Pasteur, quoted by Koestler [44].

“I have been looking for spontaneous generation for twenty years without discovering it. No, I do not judge it impossible. But what allows you to make it the origin of life? You place matter before life and you decide that matter has existed for all eternity. How do you know that the incessant progress of science will not compel scientists to consider that life has existed during eternity, and not matter? You pass from matter to life because your intelligence of today cannot conceive things otherwise. How do you know that in ten thousand years one will not consider it more likely that matter has emerged from life?”

Pasteur has been calling for a reversal of direction in doing deeper science. Because of fast track cognitive evolution, what Pasteur envisioned to happen may not take thousands of years. It will not happen in one life either! While twenty first century is the century for science of information, twenty second century is destined for science of life and twenty third century for science of consciousness. In twenty first century we should ask, *unde venis* information mechanics? And, for material science, *unde venis* exotic matter? The author has already reversed the direction of consciousness research by coining the term and concept of supracortical consciousness [45] in 1985 and further developing the idea and concept over the years, wherein the brain is not considered as the source of consciousness. The ‘Power’ is not with the brain but with consciousness, which uses brain for its manifestation. Listen to what Max Planck, the father of quantum mechanics, says, “I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.” Planck’s constants, in this sense, indicate the limit of cognitive faculty of human brain as evolved in its present state.

One day, we hope, the science might demonstrate what has been described as the Grace of spiritual Master happening through matters of physical science. However, matter science to scale that height and cognitive evolution of the brain to poise in that state of Grace, the scientists have to make a correct beginning.

The first step for a correct beginning

The first correct step in this direction is to investigate how a signal becomes information? So far, no known equipment, device or instrument can do this! The only operation which is so far known capable of doing this is by application of mind. To put it in another way, mind could be identified as an operation that can convert signal into information and vice versa.

Through ZPE in the Intergalactic space

Attention is drawn to four descriptions; quantum discontinuity, quantum void, Einstein's cosmological constant and zero-point energy state (ZPE). How are they related to each other on the boundary of present science? Do they carry identical message from contextually different points of view?

ZPE is the door for new beginning. ZPE is the gateway to sub-Planckian scale of nature. ZPE is the transit site of several systems science. One of the published [40] figures of the author on this issue is shown below (Figure 5).

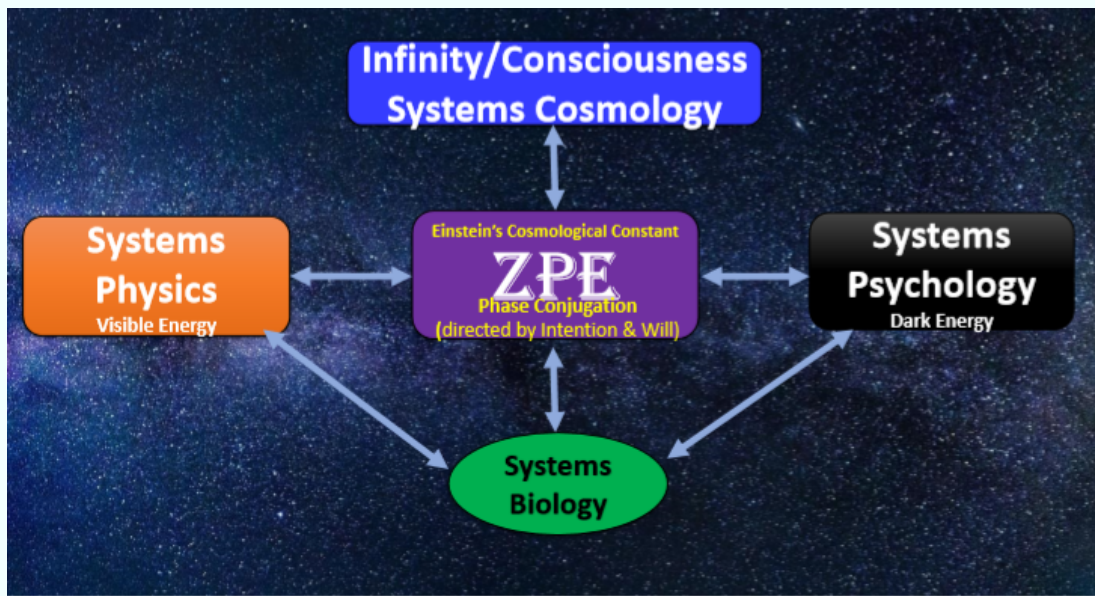


Figure 5: ZPE is the transit site, the point of meeting, coupling, conjugation and fertilization of systems physics, systems psychology, systems biology and systems cosmology. The most probable mechanism is phase conjugation. The currency in Systems physics is visible energy. Systems psychology is driven by dark energy. Visible and dark energy are balanced by life-systems. The top-down maneuverer in the process seems obvious since the process like coupling, conjugation and fertilization are driven not by any force or energy but by intention and will which come from vertical depth of nature (Infinity in the figure).

As the transition of systems physics (and systems matter) into systems psychology happening across ZPE state, we are directed towards stock of exotic matter-states near absolute zero temperature.

Cosmologically speaking we are leaving behind the comfort zone of elites and stars (some of which often exhibit unusual activism) and entering the intergalactic space. There are approximately 10^{11} stars which make a galaxy. Approximately 10^{11} galaxies make our universe! We are set to investigate the intergalactic space with approximately 10^{11} neurons in our brain! The temperature of intergalactic space is -272°C , appears to be the coldest place in this universe (compare: the inside temperature of black hole is also -272°C)! Observable matter ends and begins across the ZPE (Figure 6). Quantum physics ends and begins here. This is also the place where existence of mind loses its aim in Inane! Matter-Mind debate ends and begins here.

The readers may be reminded that bottom-up to the level of ZPE, the description covers only 4 - 5% of the universe. On the deeper side of the ZPE, 95% of the universe is left out for further investigation, of which approximately 20% is constituted by dark matter and 75% by dark energy. Dark does not mean black. It means invisible! Unstoppable (Na-rad in Sanskrit) neutrinos are expected to be abundant here, if not as-such, might be as neutrino-equivalent of consciousness (Neut-E-C). However, the interrelationship between dark matter and neutrino is yet to be established. Phonon is not phonon here (compare the inside of a simulated sonic black hole [9]). One may observe it as Bose-Einstein condensate of phonon, at the quantum-subquantum border and at deeper level as phonon-equivalent of consciousness (Phonon-E-C)! Photon is not photon here. One may observe it as Bose-Einstein condensate of photon [32] and at deeper level as photon-equivalent of consciousness (Phot-E-C)!

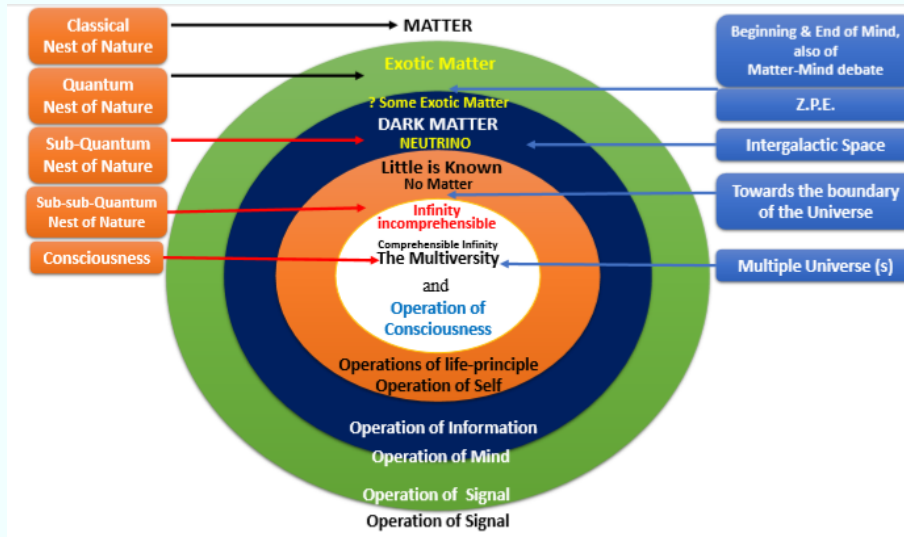


Figure 6: It shows how the essence of the material science is interconnected with the essence of the Multiversity along the nested hierarchy of nature-consciousness. There are difficult terrains, elementary operations (of psyche), different drivers and fuels. The left side of the figure labels the classical, quantum, sub-quantum, sub-subquantum nests of nature and consciousness. The landmarks such as ZPE, beginning and end of Mind and Mind-Matter debate, intergalactic space, border of the universe and Multiverse have been labelled from right side. The disposition of different matter-states in different nest is shown in the upper half of the figure. The lower half of the figure shows the prime location of different operations of the constituents of the psyche. Twenty first century is for investigation of dark matter domain and information mechanics in sub-quantum nest of nature. Twenty second century is for investigation of principles of “Life” in sub-subquantum nest. In twenty third century science will work on the largest intellectually comprehensible systems, the Multiversity. Work-out of this multidimensionally structured non-linear labyrinthine dynamics requires a time frame of three centuries in this millennium.

A new deeper investigation begins from ZPE. One issue crops up. We work with our cognitive instruments, which are mind and intellect. If those are functionless in this domain how can a scientist investigate this domain? Cognition is the operation of faculty of knowing. Cognition is a function of consciousness. Cognition influences behaviour. In reverse, behaviour feeds back cognitive operation and cognition alters conscious states. One of the faculty of cognition is the ability to ask question. Our neuroscience colleagues have developed organoid brain in petri dish [46]. Can this brain developed in the laboratory ask any question? No! There is no faculty of cognition yet embodied in this organoid! The faculty of cognition is of primary importance in cognition and the brain is required for its expression in language and behaviour. While investigating this domain of nature, the deeper cognitive faculty, the ‘self’ becomes operationally more active. Which appeared as events at superficial nests give way for phenomena at the deeper plane. The cognitive faculty as ‘self’ remains at the centre of phenomenology. Self retains the experience of the past as the episodic memory. As always, the cognitive faculty which fetches answer and asks valid question on the basis of experience, we mean the Intelligence, is prerogative of operation of a phenomenologically and axiologically integrated self. Across the zero-point energy state, there are happenings of disembodiment and embodiment of operations of mind, self, life and consciousness with several signal-based automated operations at the superficial side. Information in this domain is visualised as a trifoliate leaf (figure 3); its intent folium works with self, content folium works with mind left behind and measurable folium works with still superficial material nest of nature. The petiole of the leaf draws nourishment from ‘life’. If one looks for any unique mechanics in this terrain, it is autonomous mechanics of Information, which is connected superficially with quantum mechanics and deep with operations of self and life.

Deep through the intergalactic space, the investigation may continue from sub-quantum nest to the sub-subquantum nest of nascent nature of which nothing is known or could be imagined at this stage except the presence of life-principle and ‘self’ identified by their

operational mechanics. Information mechanics of sub-quantum nest loses its charm in this sub-subquantum nest of nature and the information is left at the evanescent border of the universe as Information crystal (wisdom) (see figure 3)!

The destination for science is across this evanescent, tunnelled, faint border of the universe. That is the domain of multiple universe(s) forming the largest intellectually comprehensible systems, “The Multiversity”. This is the comprehensible Infinity, which forms the “the sempiternal base” for having a bird’s eye view of the Real Whole.

Doesn’t such phenomenon as described above, is counterintuitive for the death of the individual? Yes, and no! “The certainty of death was absent at the origin of life”, Lynn Margulis points out in Scientific American [47]. “Unlike humans and other mammals, many organisms do not age and die.” “The process of programmed, inevitable death evolved only after our symbiotic microbial ancestor, some two billion years ago, became sexual individual.” Margulis meant by sex mating and cell fusion. “Cannibalistic fusion and its thwarting by programmed death became inextricably linked to seasonal survival and to individuality.”

While the brain of the investigator is stationed at the material nest of nature, the nonlocal elements of his cognitive faculty keep on operating in this virtual domain! This integrating ability is unique property of the organ brain! The whole universe, many scientists think, operates like human brain! Both are continuously changing and are plastic in nature. The currency of operation of both is information and various information states. Therefore, it is supposed that the operators, the cognitive faculty, are identical for operation of both!

Cognition is the operation of the faculty of knowing. Mind, self, life and consciousness are cognitive faculty. Mind cognizes for signal and information. Self cognizes for phenomenon. ‘Life’ cognizes for symmetry, uncertainty, dark matter and dark energy. Consciousness’s cognition is for wisdom (information-crystal) at the idealistic level and the attitude, especially for attitude of ‘surrender’ at behavioural level. Several information-states act as currency in the cognitive operation. All five, namely information, mind, self, “life” and consciousness are constituents (Figure 7) of the systems psyche [48].

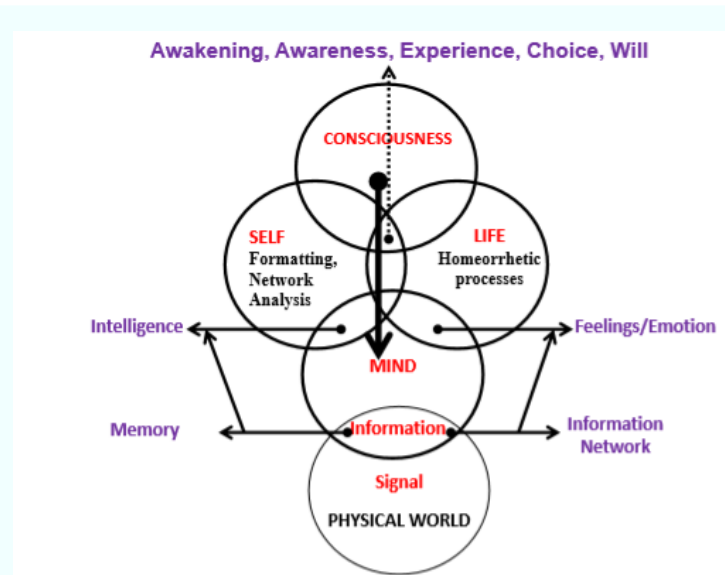


Figure 7: Shows the Cognitive organ with its faculty, and information as currency for operation. Consciousness does not interact with the physical world directly. Mind is the final common pathway for consciousness to act with the physical world. Mind also represents the first operation of cognition. Consciousness without mind is expressionless. Mind without consciousness appears sterile. Consciousness has a hotline connection with mind. It is one way. Mind cannot reach consciousness directly. Operation of Self offers cognitive process its required structure. Operation by Life make cognition labyrinthine. Coupling of operation of self, mind and memory create intelligence. Coupling of operation of life, information and mind make emotion and feelings. For awakening, awareness, experience, choice and will, coupling of three operations pertaining to self, life and consciousness is essential.

Mind and matter end and begin at ZPE. The spectrum of virtual information-states extends from ZPE to the border of the universe. Only three cognitive faculty of the systems psyche could cross this border of the universe; self, life-principle and consciousness. To put it in another way, three operations respectively of consciousness, self and life are not altered on either side of this border. 'Life' is omnipresent and embodies matter at ZPE. Consciousness and self are categorically identical. Self is 'particulate' in nature and acts as chief executive officer (CEO) of a system on behalf of consciousness. Consciousness is fathomless, the incomprehensible Infinity!

While 'self', 'life' and consciousness of the investigator are across the border of the universe, in the *essence* of the Multiversity, his material brain left behind gets enlivened and begins dwelling in supracortical consciousness (SCC). SCC is the event horizon for the human brain. Becoming aware of SCC is what makes us human! What is the unique characteristic of human being? Human being can rediscover itself, reinvent itself, remodel itself, redefine itself, which are impossible without awareness of the existence of SCC. One gets a better brain when one has access to supracortical consciousness. SCC is not privy to a few gifted individuals like, master, sage, saint or siddhas! Sociologists may cheer that SCC is universally applicable for all brains! There is no discrimination on the basis of race, religion and societal privilege!

The question for matter science, however, remains, what insulates the brain from the freezing cold at ZPE? This is probably myelin, the thick rolling layers of lipid, another matter! Beside insulating nerve fibres from each other and facilitating saltatory fast nerve conduction, this could possibly be the myelin's another role in the brain!

Matter correlates of Conscious states

Within the systems psyche, mind and information form one tango, so do the self ('i', 'me') and 'life' ('mine', my life) make another. There are layers between neuronal signals and consciousness. Similarly, there are layers between matters-syncytium of living state and consciousness. Therefore, as neuroscience investigates neural correlates/correspondence of conscious states (NCC) by PET scan and fMRI scan, there is a possibility to investigate phase patterns of matters-syncytium as matter-correlates/correspondences (MCC) of conscious states, subject to having technology of scanning exotic matter-states!

With this view in our mind, we may reconstruct a new interpretation of Francis Crick's Astonishing Hypothesis [49], "a person's mental activities are entirely due to the behavior of nerve cells, glial cells, and the atoms, ions, and molecules that make them up and influence them", especially taking into account of atoms, ions and molecules and 'life' of nerve cell and glia. We may also be nearer to the view of Max Tegmark in Mathematical Universe [50] that consciousness is material! The research questions which hover in the mind of scientist are as follows. Do we have any matter state-equivalent for the faculty of cognition? Do they leave their specific footprint/signature on the matter states?

At this stage of science, the happenings during the transition of systems physics into systems psychology are not known. Eugene Gross, a theoretical physicist suggested about 60 year back that a substance could have properties of both a solid and a liquid at the same time provided that the liquid is a superfluid. The putative matter state, according to him, might be called supersolid [51]. Does any relation exist between such exotic matter states and cognitive processes? Yes and may be! Yes, for nature-consciousness! Nature has intelligence, emotion, self-organization, and various information states which we suggest to have relation with exotic matter states. *Maybe* for the brain-states! At this stage of science, this could be tentatively expressed in a language of poetic prose! It may be said that at the level of consciousness, which if leaves its signature on mind as supersolid state of matter, information surfaces as crystal (wisdom) with fluctuating 'magnetic moment' that is independent of environmental influence. The signature of super-cool 'self' could be searched on the superconductor state of matter! 'Life' following bath in neutrino-shower glows and entangles 'web of matter' in expressing its 'love' with the universe. Her signature/footprints could be discovered as correlates/correspondences on superfluid state! Therefore, in the psychology too, all at the observable level are matters occupying space and have effect of mass! The toughest question that stares at us for the brain, is how phase transition of systems physics into systems psychology at near absolute zero temperature works in compatibility mode with systems biology of neuroscience at 37°C? We know no other device beside brain which could make to do this. How dark matter, neutrinos, information mechanics, quantum mechanics and myelin sheath of nerves can help us to sort out the issue? This less travelled terrain of material science, life science and neuroscience has real interdisciplinary research potential with translational value!

Conclusion

The article raises the mind-matter debate to the intellectually highest level possible. To look at the living state as matters-syncytium is a completely different way to start investigation on life-form. This vision takes the research on matter from its ordinary state to exotic state, informed state, self-organized state and finally to the living state. The possible interaction of cognitive faculty and the currency of cognition (information states) with different matter-states add a vertically fathomless dimension to the whole subject. That consciousness could have matter correlates/correspondences is not considered a wild imagination but has been made conceptually plausible. We have tried to address three questions in this paper. (i) What could be consciousness? (ii) How could it be related to matter and our universe/multiverse? (iii) How am I, me with my cognitive faculty is placed in the entire scenario? Basically, these are variants of three fundamental questions as raised in *Prasna Upanishad*. What is God? What is this World? Who am I? We can say that the purpose of life of a scientist is to map these three cognitive territories finding out the answer of these three fundamental questions on three "M"s; Matter, Me and the Multiversity at the comprehensible level. In this sense, the alternate title of this paper could have been, "Three absolute "M"s: Matter, Me and the Multiversity". The DeepScience required to attend all such queries has been emphasized by demarcation of subquantum and sub-subquantum nests of nature. ZPE has been conceptualized as the common meeting point of systems physics, systems psychology, systems biology and systems cosmology. Examination of neutrino-brain interaction and brain-matter wave entanglement is a pressing need of the hour. The article is full of deep insights, several interrelated concepts and many alternate directions for interdisciplinary translational research. Still the review remains open-ended on three absolute "M"s, like the concept of supracortical consciousness! The conclusion is pending. Author looks forward to readers drawing their personalized conclusion that help them to grow both in science and in technology.

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