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Non-Polluting Soundless Energy Ecosystem of a Cell

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ABSTRACT

A biological cell is drowned in the environmental energy ecosystem, which consists of matter-sourced conventional energy, information-sourced dark energy, and consciousness-sourced subtle energy. The stupendous work a cell does in its Gene machinery and the Protein factory using dark and subtle energy silently, without creating any pollution of the environment is remarkable in this respect. From the insights of cell biology highlighted in this paper, it seems there is a lot to learn from a cell to have a clean green energy ecosystem for humanity in this material world of machines.

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Introduction

Cellular behavior could be studied by the cell's three categories of activities. (a) Routine, house-keeping, signal-based automated activities. (b) Information-inspired activities initiated for maintenance of routine chore, or for a change. (c) Conscious activities such as (i) extracting information from a signal, (ii) self-nonself distinction, (iii) doing uncertainty-certainty and asymmetry-symmetry homeostasis, and harnessing dark energy for its gene machinery and protein factory (iv) learning, and retaining what is learnt as memory, and finally (v) making a choice and decision, 'will'/'won't', in a simple or a complex situation, often with creativity. Some of the conscious activities of a single cell have been referred to earlier in author's paper [1].

For the convenience of road-mapping we have categorized behaviours under three groups of activities. Activities of metabolomes come under category one; signal based and mostly automated. Information-inspired proteomic and routine genomic activities constitute category two. Epigenetic mechanisms and influences, along with some genetic activities requiring application of 'mind' are grouped under conscious activities. In fact, one category is nested within the deeper, and there are links of influence on each other yet-to-be investigated, and there lies the importance of a road map.

Unlike any material machine, any robot including large language models of AI which consume huge amount of conventional energy and contribute considerably to environmental pollution,all activities of this puzzling cellular 'machine', if it were a 'machine' at all, run silently without making noise, and does not contribute to environmental pollution [2,3]. Learning from cell biology how AI technologists can overcome the frightful phenomenology of robotic AI is made available by the author [4]. Management of the ecosystem of energy is to be learnt from the insights exhibited by the cellular 'machine'.

The Energy Ecosystem

The ecosystem of energy consists of a) matter-sourced conventional energy, b) information-sourced dark energy, and c) consciousness-sourced, and intention-sourced subtle energy, posited outwards to inwards, superficial to deeper nests of nature (Figure 1).

Figure 1: The Eco-System of Energy. Three Sources of Three Categories of Energy

Grossly it may be said that within a cell, conventional energy runs the metabolome, dark energy runs the protein factory and gene machinery, and subtle energy manipulates mainly epigenomic activities but also influences genomic, proteomic and metabolic activities.

Conventional Energy

Conventional matter-sourced energy production and storage are mediated by signal activities through metabolic pathways inside a cell (Figure 2). There is no evidence yet that this energy has any use in genetic or epigenetic activities.

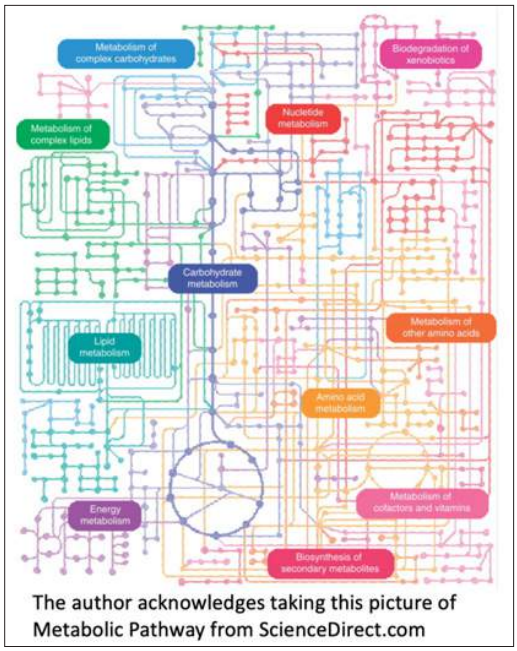

Figure 2: The Metabolic Pathway of a Cell (Ref: Sciencedirect. Com).

Conventional energy within a cell is accountable. This is generated by, and spent on the activity of the metabolome, and stored as ATP molecules, to be re-used when needed for the same metabolic activities. However, there exist several explanatory gaps in the energy economy of our cells. The adult heart weighs 250-300 gm, about 0.3% of the body weight, but consumes 4-5% of cardiac output. The brain constitutes 2% of body weight but consumes 15% of total energy, and nearly 20% of cardiac output. It is not known for what purpose this large amount of conventional energy is consumed? Such an expenditure is not accountable! Could it be accounted for the generation of the process of thinking, and for evoking feelings! A neuron consumes more conventional energy than a non-thinking cell nearby, an astrocyte that produces twenty times more ATP than a neuron, and passes these hard currencies to the 'think-tank' neurons!

What is unaccounted in cell biology is the energy required for maintenance of conformity, or its change in vital molecules such as proteins and genes. Without a definite configuration, which is in conformity with the whole, the protein molecules are functionless, useless, and eventually thrown into the catabolic bin. Where does the energy come from when a chain of amino acids as the primary structure of protein changes to a secondary, and a tertiary, and then takes up a quaternary configuration? We do not know! What offers energy during the reverse? We do not know either. Our assumption for such regular functions in the proteome is that these functions are conducted by dark energy. There is no ATP required for maintenance of, or change of conformity of protein or DNA molecules. Such conformity of structure of DNA is also of vital importance for the Genome operation and is proposed to be maintained by dark energy.

Dark Energy

What does the adjective "dark" mean in science? Does it convey more sense when we use the terms like, hitherto unknown/ unidentified or not described, unobserved, or a mechanism which is not fully known in spite of all technological efforts? Or, does it convey that it is there as non-observable and intangible! Recently a provocative article was published on dark oxygen, a second source of oxygen, found at the depth of the ocean, beside photosynthesis on this planet [5]. About 70% of the Universe is said to be dark energy! Dark matter constitutes about 25% of the universe. Dark matter attracts. Dark energy repels. Dark matter and dark energy are respectively responsible for contraction and expansion of the universe! Matter is converted into energy ($e=mc^2$) within Planck's scale of nature. Energy is supposed to convert into matter in sub-Planckian scale. That cell biology is immersive in universal cosmology becomes evident when scientists report evidence of a fascinating faculty of slime mould and unicellular ciliate, creating patterns similar to what is seen in space and hyperspace, and thus integrating spatial information for adapting behaviour [6]. As the amount of dark energy and dark matter and their interconversion determine the shape of the universe, so in a similar way they probably play a role in a biological cell for maintaining its ultimate shape and behavior. By nature, dark energy is physico-biological since 'life', in general, has access to ZPE, designated as Einstein's cosmological constant [7,8]. However, the previous assumption that dark energy is an unchanging constant has been challenged by new observations [9]. Dark energy is measured in the universal scale by measuring change in intergalactic distance over time. Is it possible to apply the same technique to measure the dark energy in a cell? Could the spontaneous movement of cellular organelles away from each other be because of dark energy? And, is their attraction towards each other caused by dark matters inside the cell, often equated with some quaternary, or spherical proteins like histone of a cell? Following exclusion of all known causes of the repulsive and attractive movement of the cell organelles, we might consider this reason. Technologically we are not able to harness this dark energy, although executed with ease by the life-forms.

The dynamics of maintenance of protein structures may be examined as shown in figure 3.

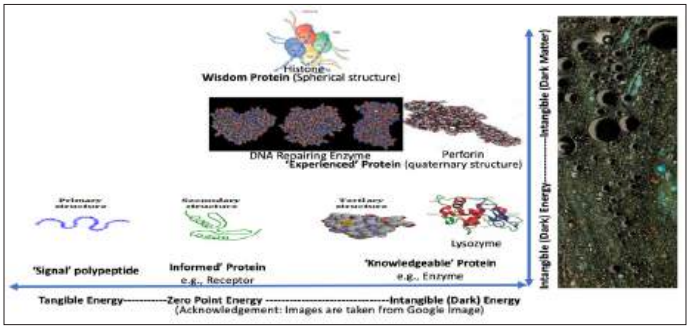

Figure 3: The X-axis of the Figure Shows the Transition of Tangible Energy to Intangible Energy Through ZPE. A 'signal' Polypeptide Transits to Informed Protein (e.g., a receptor) with Acquisition of Secondary Structure, and to Knowledgeable Protein (e.g., an enzyme), with Acquisition of Tertiary Structure. The Y-axis Shows the Transition of Intangible Dark Energy to Intangible Dark Matter (e.g., 'Experienced' Protein having Quaternary Structure and Spherical Protein like Histone). On the Right Side of the Figure, Shown is the Image of Dark Matter.

The connection between genomics with epigenetics is mostly through the largest spherical protein of the cell, histone. Chromatins are said to be the drivers of nuclear organization [10].

We do not know the energy consumption during ascent and descent of various information states along the ladder of cognition [11]. What converts a signal into a piece of information, and where does it happen inside a cell? The concept of a signalosome and

of SMOC (supramolecular organizing center) has been brought forward [12,13]. However, the concept is silent on metabolic need of energy in this context. We appropriate a significant role of dark energy in signal to information and information to signal activities! According to the author, dark energy is sourced from an information-split phenomenon, by an unknown operation across Zero-Point Energy (ZPE), resulting in delivery of space, time (which together make a 'form'), and energy [14].

How a bunch of similar information is converted into a pack of knowledge inside an individual cell? How, knowledge is transformed into the cell's experience, and then into wisdom? Signal, information, knowledge, experience and wisdom make up the series of information states in the ladder of cognition! Where the 'knowledge', experience and wisdom of a cell are stored? Does the cell take help from the structural reform of protein in this matter? What energy is used in such activities? We assume it is dark energy. The research question is in what conformity, the proteins and genes are used as substrates for such information states? There could be more than one operation in between (Figure 4).

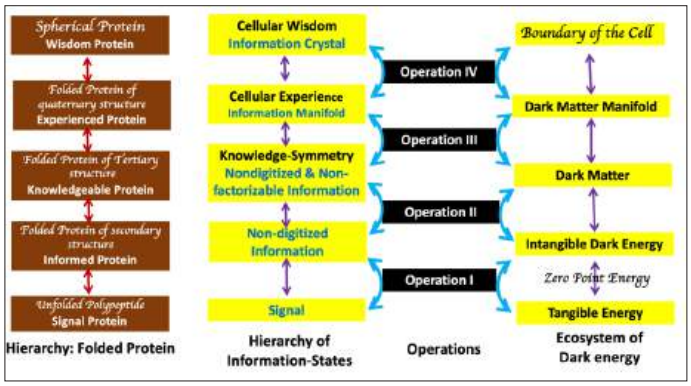

Figure 4: On the Left Column of the Figure Shown is the Hierarchy of Folded Proteins. Next Column Parallels the Hierarchy of Information States. Third Column Shows the Consecutive Operations from Below Upwards. The Right-Hand Column Shows the Ecosystem of Dark Energy

Subtle Energy

Dark energy is not subtle energy. Many mainstream scientists (e.g. William Tiller of Stanford) have produced unignorable experimental evidence of the presence and operations of subtle energy in the material phenomena [15]. Scientists often differ in stating what is subtle energy? Leaving aside their differences, the author, since 1987, has had a consistent view on the micro-vibratory physics of this subtle energy [16]. This is constituted by an extraordinary group of four wave packages of energy namely photon, phonon, conformon and neutrino. All of them are well known in mainstream science. Except conformon, others are detectable and measurable by available equipment. The choice as a group is because of their a) eight common properties and b) subtlety.

a) Eight common properties of subtle energy are as follows. They are (i) beyond the polar opposites of a particle and its antiparticle, (ii) massless, or acquire mass by interacting with Higgs Boson, (iii) without any color and charge, and (iv) virtually abundant in the universe across the nested hierarchy of nature, (v) available to everything and everyone 'ad libitum'. Characteristically, four waves/particles seem (vi) 'conscious' (vii) since they are hypothetically consciousness-sourced. They show (viii) interpenetration of space, time, and cause in their behavior, which means all four of them, in addition to energy, conveys information ('gnergy'). Korean scientist Sungchul Ji, another mainstream scientist, was the first to formulate around 1972, the concept of 'Gnergy' as the hybrid union of information ('gn-') and energy (-ergy) in the context of photon and conformon [17]. He advanced the original conceptual formulation of conformon by Ilya Prigogine in the context of maintenance of conformity of DNA molecules for functioning. The present author developed the idea farther to state that conformon conveys information on the conformity of the whole, phonon conveys information on the rhythm of the whole, photon conveys information on the dynamicity of the whole, while neutrinos convey information on the openness of the whole.

b) Subtlety: What makes them subtle is their hybrid combination with information, and assumed connection with subtle aspects of 'life', and consciousness. All of information, subtle life and consciousness are pre-quantum in activities, posterior to ZPE and quantum void! Like dark energy, we have no way yet to harness subtle energy. However, human brain functions are influenced by subtle energy. Human brain can harness subtle energy. Neural networks cannot!

Of the four particles/waves, only one might work individually in a cell, as we see in the case of higher octaves of ultraviolet photon, biophoton, neutrino and conformon. More than one particle/wave from the group of the four might work in a combination, e.g., photon-phonon in dissipative structures of a cell to keep the cell in a non-equilibrium state. All of the four in combination might operate as an information holograph [18]. In contrast to quantum entanglement in the inanimate world, we should examine the concept of information holograph that leads to information entanglement in the animate world.

In a Stimulus-Response Template subtle energy works on the epigenome, genome. proteome and metabolome of a cell as shown in figure 5. Photo-phonon manipulates metabolomes. Conformon manipulates the genome and proteome. Neutrinos manipulate the genome and epigenome.

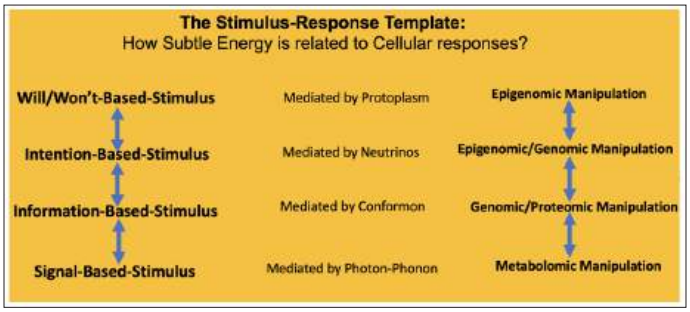

Figure 5: The Left Column Classifies the Hierarchy of Stimuli. The Central Column Respectively Shows the Subtle Energy Mediator. The Right Column Shows the Target of Manipulation

The Road Map

At the end, we present a road map (Figure 6) how the subtle energy could be investigated in cell science. Every kind of energy, whether matter-sourced, information-sourced, or intention/consciousness-sourced, operates in response to a stimulus. Stimulus may be signal-based, information-based, intention-based and consciousness-based. The targets (responders) are respectively metabolome,

proteome, genome and epigenome. Respective responses are shown in the extreme right column of the figure 6.

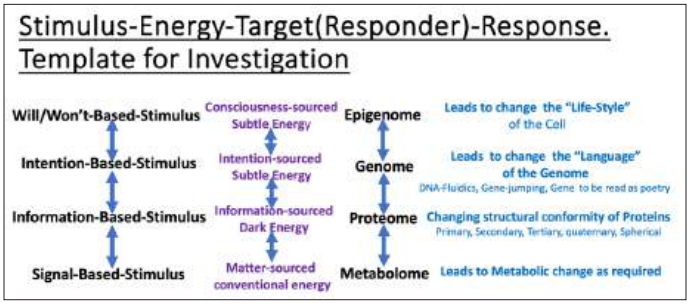

Figure 6: The Template for Investigation in Cell Biology the Stimulus-Energy-Target (Responder)-Response Pathway

One is required to formulate appropriate research questions, make research hypotheses, and find out the latest technology available in cell biology for defining concrete research proposals. Several PhD scholars can work on this agenda. The Technological Institutes might ponder on these valuable insights obtained from a biological cell.

Concluding Remarks and Farther Perspectives

The *Cell Press* family on their 50th Anniversary is celebrating science that inspires new directions. At this moment of joy, we published this paper on the road map for research to learn from a biological cell how it manages the energy ecosystem. Each of our cells holographically represents the universe we inhabit [19,20]. Cell biology and multiversal cosmology run together, the former within the latter.

Any biological entity could be identified by its capacity to draw homeostasis. Failure of homeostasis in proteomes (proteostasis) leads to neurodegenerative disorders, failure of genomic homeostasis leads to developing autism, and the failure of epigenetic homeostasis has been identified with cardiovascular disease [21-23]. At a finer level, a cell is engaged in uncertainty-certainty homeostasis, the failure of which leads to Anxiety. The cell is also engaged in asymmetry-symmetry homeostasis, the failure of which leads to Stress. Finally, a cell manages homeostasis of dark energy and conventional energy, the failure of which results in Depression [24]. Bacteria's stress strategy to slow down to avoid the crowd might have the influence of subtle energy [25]. Subtle energy also might have influences in wound healing, which could be studied using spatial transcriptomic and proteomic approaches (spatial biology).

The issue is how conventional energy, subtle energy and dark energy maintain an equilibrium in cellular economics? Can the advanced single cell amplification technology on metabolomics, proteomics genomics and epigenomics help us to understand the issues raised. A living cell itself participates in the ecosystem of dark and visible energy homeostasis in this universe. While human cells constitute only 0.01% of the total biomass of the earth, microbes contribute to approximately 17% of the biomass of the planet. Imagine the biomass in the entire universe and its relation to energy ecology! We require a biotechnological tool to harness dark energy. Clean energy would boost climate action, public health and sustainable development. World economics is run by both 'White' money and 'Black' money, the latter in magnitude is much larger than the former. In their interconversion, there is subtle manipulation by the influential handlers. From a cellular model, can we contribute to world economics by optimising this present imbalance?

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