

Article

Transcendent Origin, Structure & Encoding of DNA

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Abstract

We discuss the origin and modification of DNA macromolecules and the negentropic generation and evolution of intelligent life and human consciousness. This paper deals with the conjectured transcendent origin, structure, and encoding of the DNA molecule which produced the diversity of species which we observe and study - and the instrumentality of consciousness that observes and studies it.

Keywords: Intelligent life, transcendent, DNA encoding, consciousness, cosmos, mesostratum, physiostratum.

Introduction

Biologists often describe DNA as a primordial high technology structure that contains over a hundred trillion times more information by volume than the most advanced digital information storage device. This self-duplicating, information-storing molecule - only ten atoms wide - constitutes a form of ultimate technology as yet unmatched by quantum computer science. The DNA double helix surpasses Richard Feynman's potential encyclopedic information content in a grain of sand in its ability to not only store information but to transmit and transfer it remarkably accurately generation after generation. In his classic lecture *There's Plenty of Room at the Bottom*, Feynman notes, "All this information - whether we have brown eyes, or whether we think at all, or that in the embryo the jawbone should first develop with a little hole in the side so that later a nerve can grow through it - all this information is contained in a very tiny fraction of the cell in the form of long-chain DNA molecules in which approximately 50 atoms are used for one bit of information about the cell."

The DNA that spawned and enabled the humanoid species dates back tens of millions of years. That same DNA consistently gave astonishing intellectual thinking capacity to humans. Evidence shows that the cave man, the Neanderthal, possessed intelligence that rivals modern humans. In their primitive, emergent situation, they had no means nor incentive for making microchip-based computers. But they produced ingenious art and invented tools for survival with adroit use of the resources available to them. From the Bronze Age onward, the technological infrastructure and capabilities of contemporary 'computing machines' began to compound exponentially. Among ancient computing machines we may include the Stonehenge and the Egyptian, Aztec and Mayan pyramids.

All humans alive today harbor the same primordial DNA and genes which promise continued evolution. It will be argued that the primordial DNA and all current modulations and versions

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of it arose as the result of an synergistic iterative design process governed by a ubiquitous universal consciousness which is shared by each individual higher consciousness.

In the process of writing *The Origin of Species* Charles Darwin of course had no access to modern genetic science, if he had, he almost certainly would have endeavored to focus on and entitle his monumental work *The Origin of DNA* with the subtitle *The Modification Thereof by Natural Selection and Evolutionary Biology*. This paper deals with the conjectured transcendent origin, structure, and encoding of the DNA molecule which produced the diversity of species which we observe and study - and which produced the instrumentality of consciousness that observes and studies it.

Tutorial and Recapitulation

Replication Mechanism

DNA (deoxyribonucleic acid) is a long macromolecule that transfers genetic characteristics in all life forms. It consists of two helical strands coiled around each other. DNA is composed of alternating phosphate and deoxyribose units connected by ladder-like rungs composed of purine and pyrimidine bases. The genetic information of DNA is encoded in a sequence of bases and is transcribed as the strands unwind and replicate. DNA typically includes three billion rungs or bits of a digital code. The rungs that comprise a DNA genetic alphabet engage four nitrogenous bases: adenine, thymine, guanine, and cytosine. Sugar molecules (ribose or deoxyribose) bind the chemical alphabet while phosphate molecules bind the sugar molecules together to form the double helix. The human genetic message contains a total of 6 billion base pairs, or 12 billion 'letters'. The DNA filaments contained in the nucleus of a human cell wrap around each other several hundred million times and can be stretched out two meters.

RNA (ribonucleic acid) is a single-stranded molecule transcribed from DNA within the cell nucleus. The RNA strand is a linear sequence of nucleotide bases that is complementary to the DNA strand from which it is transcribed. A nucleotide is any group of molecules linked together as building blocks of DNA and RNA. Messenger RNA is a single-stranded molecule of RNA that is synthesized in the cell nucleus from a DNA template. Messenger RNA enters the cytoplasm (the substance between the cell nucleus and membrane) where its 'genetic code' specifies the amino acid sequence for protein synthesis. The genetic code provides biochemical instructions that translate the particular genetic information that is present. This results in a linear sequence of nucleotides in the messenger RNA producing a specific linear sequence of amino acids for the synthesis of particular proteins. Then, single enzyme proteins or complexes of two or more proteins operate autonomously as 'molecular machines' without immediate reference to the surroundings. These complex enzyme proteins assure that DNA and RNA function systematically and cooperatively. Proteins usually contain amino acid chains between 100 to 500 in length. There are 20 amino acids that are assembled into a variety of over 100,000 functional proteins in humans.

The Genetic Code

The recursively complex DNA code structure - which is common to all species - is designed to contain redundancies and similarities. Some of these express themselves as 'vestigial organs' - presumably left over from previous stages of evolution. Such organs may appear as superfluous floating hind limbs in whales or the tailbone (coccyx) in humans. These are simply by-products of iterative engineering design protocols. In a similar manner, human designers borrow ideas that have merit in one situation and use them in other situations. These borrowings may be discarded in the final design or may simply become 'vestigial junk' or be used in a different way in a successive construction code. Apparently, the coccyx was retained in the genetic design code and made part of the human skeletal frame as an important point of muscle attachment required for the distinctive human upright posture

The genetic code exhibits the properties of a digital code that derives its significance from prescribed and consistent definitions. A digital language requires context, that is, a lexicon of conventions that are *external* to the code itself. An effective digital code also demands careful expert design. According to Dembski and Colson in *The Design Revolution*, DNA is a dynamic structure that exhibits an underlying design. The nucleotide base pairs are continually vibrating, forming and closing gaps throughout the DNA at femtosecond intervals. Evidence of design may be inferred because the system remains stable as 'repair' enzymes find and correct flaws along vast stretches of the DNA. A deliberate redundancy in DNA design provides alternative codes that improve its error-correction capabilities. These codes are stored in an integral master plan and are duplicated by a transcription machinery into the working copy RNA which is then translated into the instructions from which the amino acids are converted into the necessary protein and enzymes.

The transcription enzymes read only the parts of the DNA text that code for the construction of proteins and enzymes. These passages are genes which are estimated to represent roughly 3 percent of the human genome. The remaining 97 percent are not read - their function is unknown. Spread out among the non-coding parts of the text are long repeated 3 to 4 letter sequences, including palindromes - that can be read in either direction - with no apparent meaning. This apparent gibberish, which constitutes the overwhelming portion the genome is called junk DNA. This junk often consists of tens of thousands of repetitious passages. Among them is a 300-letter sequence that is repeated a half a million times. These sequences make up a full third of the genome. Their meaning is unknown and this has compelled genetic biologists to admit that the vast majority of DNA in our bodies does things that we do not presently understand. Biologists are not yet privy to the 'external' information, plan or lexicon needed to interpret the genetic code woven into the DNA molecule. Despite the intense efforts being expended in the Human Genome Project to discover the roles of junk DNA, the cause of individual differences and many other genetic code-related questions remain unanswered.

The creation of these self-replicating entities indicates intricate original programming of DNA and goal oriented, deliberate and innovative design concepts. Minor experimental and evolutionary tweaking and upgrading do not compare with the landmark appearance of the fundamental DNA code that signaled the arrival of the human species endowed with the capacity for intelligent thought. It is altogether reasonable that after 'jump starting' living organisms

- including microbes and plants - the basic DNA replication machine was embedded with codes for adaptive self-correction and enhancement: evolutionary tweaking.

Surely, as the Human Genome Project begins answering these questions, the next objective should be to code and construct a new version of DNA. As science discovers more about genomic structure, we will want to re-engineer human DNA, perhaps even the DNA of other biological organisms. Some re-engineering may take the form of cosmetic adjustments, health enhancement, or be dedicated to producing a 'super species' perhaps an intellectually superior species. But all this is may be a form of 'patching' with an awakening knowledge the 'source code' that originated human DNA.

Information Transmission and Communication

The conventional view is that DNA information is transmitted in the form of 'sequential information' - replicated chemokinetically when the cell divides. The information is transcribed as messenger RNA and 'expressed' by genes. After the messenger RNA information is edited and processed, it migrates from the nucleus to the cytoplasm where it is 'read' by a specific ribosome that translates it into protein.

Be the organism a bacteria, a carrot, or a human the DNA comprising it does not vary in overall form from one species to another; only the order of words and sentences of the sequential information are modified. It is possible to extract the DNA sequence in the human genome containing the instructions for making insulin and splice it into the DNA of a bacterium, which will then produce insulin similar to that normally excreted by the human pancreas. Ribosome are like cellular machines that assemble the proteins inside the bacterium. They understand the same language as the ribosomes inside human pancreatic cells and use the same 20 amino acids as building blocks.

There appears to be something that is beyond purely chemokinetic transfer of information represented by a sequence of chemical words and sentences of the DNA molecule. The molecule exhibits the structural properties of an *antenna* that sends and receives bursts of electromagnetic signals. It is now established that DNA emits photons and also responds to photons, it is an information antenna that communicates globally with signals so weak that only recently has equipment emerged that is capable to detect those signals.

According to the hypothesis of Jeremy Narby in *The Cosmic Serpent*, there is a link between DNA-emitted photons and transmission of genetic information. In general, bio-photon emission is a 'cellular language' - a form of communication within cells, among cell colonies and their host organisms. Cells and their DNA apparently globally broadcast tiny electromagnetic waves - *wirelessly* trans-neuron - to direct their own internal reactions as well as to communicate between and among themselves.

Jeremy Narby advances the notion of the role of DNA in global information storage and transfer by noting that, in a mere handful of soil, there may be approximately ten billion bacteria and one million fungi. Narby writes, "This means that there is more order, and information, in a handful of earth than there is on the surfaces of all the other known planets combined. . . . The information

contained in DNA makes the difference between life and inert matter. . . . The earth is surrounded by a layer of DNA-based life that made the atmosphere breathable and created the ozone layer, which protects our genetic matter against ultraviolet and mutagenic rays . . . the planet is wired with life deep into its crust . . .” Accordingly, DNA “. . . . proves by its very existence the fundamental unity of life.” . . . and of consciousness [1].

DNA and Consciousness Emergence

Stuart Hameroff and Roger Penrose in *Toward a Science of Consciousness* cite as essential for consciousness the cytoskeletal microtubules and related structures within each of the brain's neurons. Cytoskeletal structures are clearly the expressions of specific genes that reside in DNA. There are particular characteristics of microtubules make them suitable for quantum effects to which Hameroff and Penrose attribute the emergence of consciousness. These quantum effects depend upon the neuron's crystal-like lattice structure, hollow inner core, organization of cell function, and structural capacity for information processing.

It is inescapable that DNA is much more than a chemokinetic mechanism for replication and repair and maintenance of the body and its cells. DNA obviously provides for cell differentiation and elaboration into various organs. Less obvious, but essential functions of DNA are its provisions for communication and interpretation of information not only for survival and communal behavior but also for consciousness - which relies heavily upon very special design aspects and expressions of DNA genetic codes.

In *What Is Thought?* Eric Baum argues that the mind is programmed by DNA. He proposes a computational explanation of consciousness. Baum maintains that the complexity of mind is simply the outcome of evolution and that to understand the mind we need to understand the evolutionary process that produced it in computational terms. He assumes that evolution ‘discovered’ corresponding ‘subroutines’ and ‘shortcuts’ to speed up its processes and to construct creatures whose survival depends on quickly making right choices. Baum concludes that the structure and nature of thought, meaning, sensation, and consciousness emerge naturally from the evolutionary processes.

Baum ignores evidence that the evolutionary processes appear to have originated spontaneously - directed by a focused negentropic phenomenon, as proposed by Erwin Schrödinger in his classic *What Is Life?* Baum is undoubtedly right contending that evolution of the brain took place via the ‘organic’ evolution of DNA - which arguably came after the origination of DNA from outside the perimeter of organic evolution. The overall evolutionary process contended by Baum should be seen as a consciously-contemplated design iteration and refinement to adapt a primordial DNA to earthly chemophysical environments. Instead, Baum invokes the unprovable notion that all the intricate elements of the DNA computer code arose by chance combined with fortuitous coincidences.

Baum does allow for a vast computer power and resources implied by the emergence of human intelligence and thought. We are tempted to classify Eric Baum among those who believe that *souls* are software. But like most evolutionists Baum refuses to allow for an *outside* transcendent originating event or concept. DNA has such a conspicuous abundance of

symbiotic simultaneous intertwined attributes that it is virtually impossible not to assign its origin and programming to agents that transcend the material world - indeed, to spiritual designers that preceded humanity and operate astride the material world.

It seems self-evident that the original concept and creation of the self-replicating and intricate programming of DNA denotes a deliberate and innovative 'external' design process. This is strengthened by the amazingly efficient way that DNA structures the neural attributes of cells and organisms react and respond 'intelligently' to their environments. More amazing is cell to cell global, non-local, trans-neuron communication. Beyond that are the globally diffuse displays of self-awareness and consciousness - certainly those displayed by higher organisms.

Symbiotic Tangled Entelechy

The improbability of abiogenesis and evolution of higher life forms has been compared to the improbability of a tornado sweeping through a junkyard and assembling an airplane. From the modern evolutionary standpoint, while the sudden appearance of cellular and higher life forms are improbable, evolution proceeds nevertheless, slowly, stepwise, stochastically. Viewing the human body as a communal super-colony consisting of trillions of differentiated cells moves our attention to an exploration of symbiosis.

Some symbiotic relationships are obligate in that both symbionts entirely depend on each other for survival. Others are facultative, meaning that they can but do not have to live with the other organism. Symbiotic relationships include those associations in which one organism lives on another, or where one partner lives inside the other (such as lactobacilli bacteria in humans). Strange symbiosis loops prevail wherever life appears, down to the level of individual cells which cannot exist viably without the presence of symbiosis among enzymes, amino acids, cell membranes, and nuclei.

One of the most improbable symbiosis loops is described by Douglas Hofstadter in *Gödel, Escher, Bach: an Eternal Golden Braid*. Hofstadter describes a paradox which he entitles 'which came first-the ribosome or the protein?' He writes: "Ribosomes are composed of two types of things: (1) various kinds of proteins, and (2) a kind of RNA, called ribosomal RNA (rRNA). In order for a ribosome to be made, certain kinds of proteins must be present, and rRNA must be present. For proteins to be present, ribosomes must be there to make them." Hofstadter asks, "Which comes first, the ribosome or the protein? Which makes which? Of course there is no answer because one always traces things back to previous members of the same class, just as with the chicken-and-the-egg question, until everything vanishes over the horizon of time."

Recapitulation Conjecture

Available evidence indicates that the DNA/RNA alphabet and its associated codes have remained essentially unchanged throughout the history of the earth. The probability of the specificity and precision having arisen and evolved randomly or by chance is nil. There is accumulating support for declaring that the emergence of life and thinking beings represent a process of information transfer from a universal consciousness to the material world, as discussed later. The result is

human intelligence and higher consciousness that transcends material neural systems and the pervasive domain of the DNA antennae.

We discover an improbably entangled entelechy when we ask: which came first, ‘the ribosome or the protein?’ or ask ‘which came first, the chicken or the egg?’ In the grand scheme of things they are one and the same: an improbable unity. The egg is the chicken, the chicken is the egg, the one is nothing without the other. The egg alone in the universe is meaningless. The yolk without the shell is meaningless. The embryo without the yolk is meaningless. It is senseless for eggs or chickens to exist separately and apart in the cosmos. Entelechy as represented by egg/chicken/egg loop is a realization of a potentiality that resides in the mesostratum energetic hyperspace. Ribosome-protein and chicken-egg potentiality loops and other loops ostensibly exist simultaneously. We conjecture that our material reality is but a product, a projection, a sequential ontogenetic realization of primordial preordained potentiality loops.

The hypothesis illustrated in Figure 1 is that the entire life-cycle of the butterfly - from egg to caterpillar to chrysalis to butterfly to egg - exists holographically, simultaneously, instantaneously in the mesostratum, complete in every essential and minute biological detail. Of course, all mesostratum butterfly specifications are encoded in butterfly DNA which unravels in the physiostratum as the butterfly is realized stage by stage, sequentially. We see each butterfly illustrated in Figure 1 at one specific stage of its life cycle.

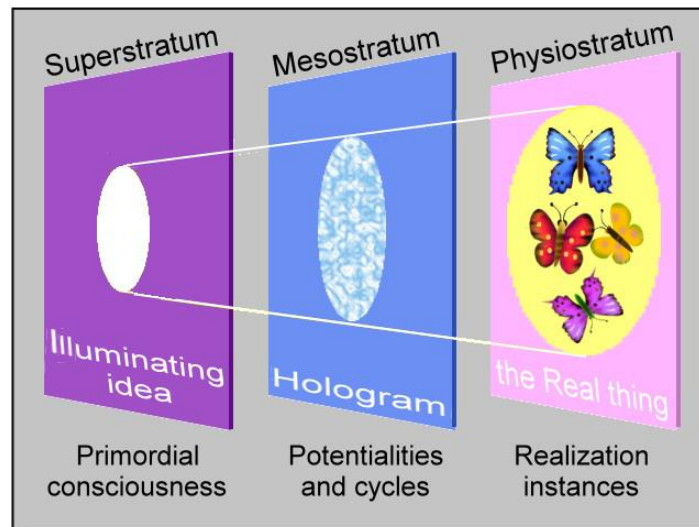


Figure 1 - Superstratum~mesostratum~physiostratum triad.

Whether we speak of butterflies, roses, humans, planets, or stars it is apparent that all undergo cycles that are somehow patterned and that each stage of the respective cycle is orchestrated down to the finest detail and mathematical form. We deduce that these implicit designs, patterns, forms, and governing laws exist transcendently, apart from the physiostratum. We argue that these designs reside in the mesostratum which also provides the energetic instrumentalities enabling a primordial consciousness to create, project, and interweave the objective cyclic realities of the physiostratum.

The physiostratum putatively provides the venue for sequential ontogenetic realization. Accordingly, we contemplate the superstratum of pure thought, as depicted in Figure 1 and conjecture that the cosmos (the physiostratum) materialized as a subset of the universe (the superstratum) as a projection of pure thought - a supernal consciousness which ideated and assembled and perhaps continues to assemble the chaotic milieu of the cosmos - endeavoring to put things into spatiotemporal order - extracting, modifying, evolving an objective reality using the energetic signal modalities of an energetic mesostratum. It is a negentropic scenario of a 'work in progress' of a supernal consciousness that continues to evolve and reinvent itself.

The material realization of a potentiality depicted in Figure 1 suggests that a holographic template pre-exists the realization and programming of DNA accompanied by a feedback loop by means of which genetic modifications appropriate for diverse species are accomplished.

We argue that the genetic modifications are instructed by intellectual entities, namely, memes. In *The Selfish Gene*, Dawkins urges us to take the idea of meme evolution literally. Memes are replicating ideas. Not just simple ideas, but quite complex templates that form themselves into distinct units that influence and engender genetic evolution. Physiologically, they produce alleles, or alternative genes, that compete with existing genes and when successful, cause hereditary variations. The original genes will attempt to repudiate these newcomers, but after many replications, successful alleles may prevail in a new branch of species evolution. We suggest that memes are informational signals or waveforms in the energetic mesostratum - acting as communication media that influence epigenetic modifications and evolution.

These speculations and conjectures about life cycles templates and their material realizations still do not explain the origin of DNA - the 'backbone' of life, its replication, and consciousness. Our explanation of the origin of the DNA molecule invokes the idea of a superstratum~mesostratum~physiostratum triad and a supernal consciousness which incorporates Astral agents that not only create and program the DNA molecule but the cosmos and planetary habitats and environments suitable for the emergence of life and intelligent beings.

Superstratum~Mesostratum~Physiostratum Triad

Mind Loop & Soul-Spirit-Body Triad

It is clear that any discussion of supernal consciousness involves the idea of a mind which transcends material embodiment. The *mind* as we conceive it spans three strata: (1) the *superstratum* (the transcendent domain of pure thought), (2) the *mesostratum* (the mediating domain of information, signals, energetic ZPF fields), and (3) the *physiostratum* (the domain of spacetime and objective material reality) [1]. In this context, the mind is envisioned as extending from the superstratum continuum to the physiostratum discontinuum via signals through the energetic mesostratum interface, as depicted in Figure 2.

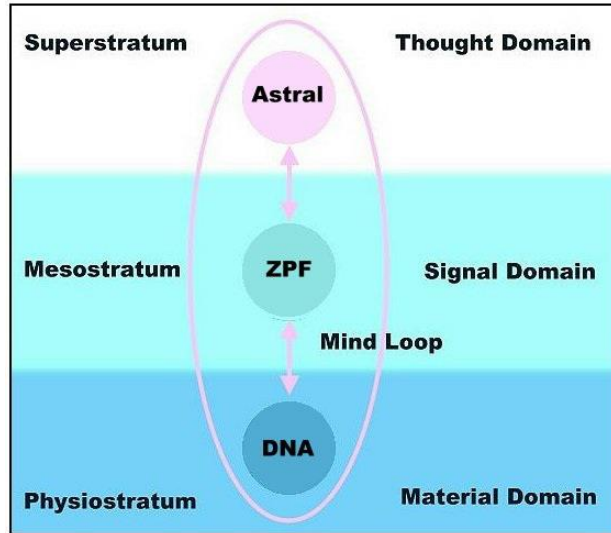


Figure 2 - Mind loop triad modulation of DNA.

In Figure 2 we adopt the notion that each soul-like Astral is the superstratum focus of a conscious entity. The DNA as represented by the brain/body is the physiostratum focus of a transcendent consciousness. The mind is defined essentially as a loop that unites the Astral entity and DNA foci via a mesostratum download/upload signal cycle. The challenge is to deduce how Astrals employ the ZPF (zero point field) and its energetic signal content and the mind upload-download loop to originate DNA and consequent biological entities which possess consciousness and intelligence.

The physiostratum discontinuum is conceptually a subset of the superstratum continuum. Elements of the superstratum and physiostratum commingle in the mesostratum interface. We are aware of the transcendent superstratum and mesostratum indirectly by their ubiquitous influence on the material domain primarily at the quantum level and by their influence on our consciousness and our experience of adjacent realities.

Adjacent Realities

The wave function and associated spin, charge, mass describe and define subatomic entities while their particulate nature defines their physical location in spacetime. This may be construed as an imagined wave-particle duality - or a pairing of two separate *sequential* realities. Conversely, we perceive adjacent realities, *concurrent* transcendent and material realities: the wave function is a mesostratum transcendent aspect while the particle is a physiostratum material aspect of a singular entity, for example, an electron or photon. These adjacent realities are combined and form the mind loop which orchestrates our conscious awareness of our tangible particulate objective reality and adjacent wave function signal continuum.

Retina-Consciousness DNA Education

The retina-consciousness relation is inherent to DNA structure and coding. Consider the retina, a biological photon-detector screen, which undergoes about a trillion photon impingements per square centimeter per second. The neural network associated with the retina processes the chaos of

retina-impinging photons and extracts and refreshes information about 'what is out there' - an image of the world. But, we do not 'see' the constantly refreshed flat image on the retina which is made pixel by pixel, indeed quantum-by-quantum.

We 'see' what is out there - the result of neural processing of the flood of incoming signals. The overall signal information content consists of more than colors in the scene. In concert, the trillions of photons convey information about textures, shapes, topology, inter-relationships, etc. among the emitters of the photons as they reach the retina - producing the epiphenomenon of 'seeing' the scene 'out there' in space - in the venue of objective reality.

This illustrates how the mind loop and consciousness process the signals supplied by the retina/optic/neural system. Consciousness, using information assembled by the mind, orchestrates the chaos of photons from the flat retinal image - and extracts and refreshes information about what the image means - portrays it as an image of three-dimensional reality. Our higher consciousness tells us that objective reality exists 'out there' - and indeed persists even when unobserved - and that our body/brain is part of the reality 'out there'.

This leads to the concept of the mind loop together with consciousness as an orchestrator of informational signals, where the confluence of signal parcels instantiate a physical neural process - where an attractor is configured so that everything will be topographically coherent. Among the essential features of the mind loop are its metaphysical and contemplative attributes which transcend the neural network and constitute the epiphenomena of consciousness. We consider the 'mind loop' as an upload-download modality which is facilitated and sustained by the mesostratum and the energetic ZPF subset of the mesostratum.

What is illustrated is that the conscious mind constructs and sees an objective reality - beyond the flat retinal image - we do not see the flat image on the retina - we see the objective, indeed 4-dimensional, reality beyond the retina via signals impinging on it. We conjecture that our perception of objective reality informs and influences the DNA core of our being - that environmental signals select, modify, and regulate gene activity and that our genes are constantly being remodeled in response to life experience. We conclude that our life experience leads to epigenetic shaping and reshaping. We conjecture that our body, neural network, and indeed our DNA originated, evolved, and continues to evolve as the tangible reality revealed by our senses - that DNA is *educated* by interplay between a higher consciousness and the material world.

Epigenetic Lucy

The developing science of epigenetics is revolutionizing understanding of the link between mind and matter and profound effects on our personal lives and the collective life of our species. Epigenetics reveals that our genes are constantly being remodeled in response to the objective reality in which we are immersed. At the most elemental level, the cell membrane interacts with its environment and therefore controls the cell's response - it is in a sense the cell's 'brain'. We suggest that the cell membrane - like a computer chip - is programmable and that the programmer is a higher consciousness which transcends the cell. The cell 'membrain' exhibits a behavior and epigenetic activity comparable to the information uploaded-download to-from the physical entity (the cell, the neurons/body/brain) - via a virtual mind loop.

In November 1974, the bones of a prehistoric humanoid were discovered on the slope of a desert channel at Hadar located in Ethiopia. The small skeleton was a remarkable discovery and a significant link in the search for human ancestors. The discoverer Donald C. Johanson and his coworkers named the hominid Lucy Australopithecus Afarensis (after the Beatles' song 'Lucy in the Sky with Diamonds'). Lucy was a tiny-brained individual, a little more than 1 meter tall. Lucy walked erect on short stubby legs three million years ago. Beyond Lucy's epoch of human development, epigenesis prompted brain development, an upright walking stance, and increased hand dexterity through tool use and the need to effectively manipulate the environment. Today, many of Lucy's decedents not only walk upright but are tall, slender and have long attractive legs. They stride confidently on stiletto high heel shoes. They still have fairly large vestigial pelvic bones but these are devolving remnants from the past. Evidently, we may conclude that Lucy and her progeny took a good look at the prevailing reality and via a higher consciousness and associated mind-loop activities induced genetic changes which engendered radical DNA reprogramming leading to a more idyllic body.

Attractors, Akasha, and Astrals

Consciousness Materialization Cycle

The tutorial argues that primordial DNA and all current modulations and modifications of it arose as the result of a synergistic iterative design process. The DNA structure demands the synergistic preexistence and availability of four nitrogenous bases: adenine, thymine, guanine, and cytosine. To form the DNA double helix sugar molecules that bind the bases must also be present along with phosphate molecules to bind the sugar molecules. For a ribosome to be made, certain kinds of proteins must be present, and rRNA must be present. For proteins to be present, ribosomes must be there to make them. Specific DNA structural components need to be fabricated abundantly and exist in close proximity prior to assembly of the DNA macromolecule and cellular matter containing it. The design and engineering of primordial DNA also assumes the preexistence of a life-friendly surroundings and clement climate.

The cycle depicted in Figure 3 incorporates the notion that our bodies and everything around us did not simply pop out of the energetic ZPF substratum but are constructs of a universal consciousness. The process may be seen as a work in progress wherein terrestrial observations are returned for evaluation in an iterative design process. The cycle is derived from the idea that the universal consciousness cannot remain idle and unproductive but needs and makes tangible resources - which implement the Keppler Effect: use of physical stimuli to trigger the formation of new attractors or structural modules. Eventually, the cycle may result in the epigenetic re-engineering of various DNA structures, substructures, and myriads of genetic components.

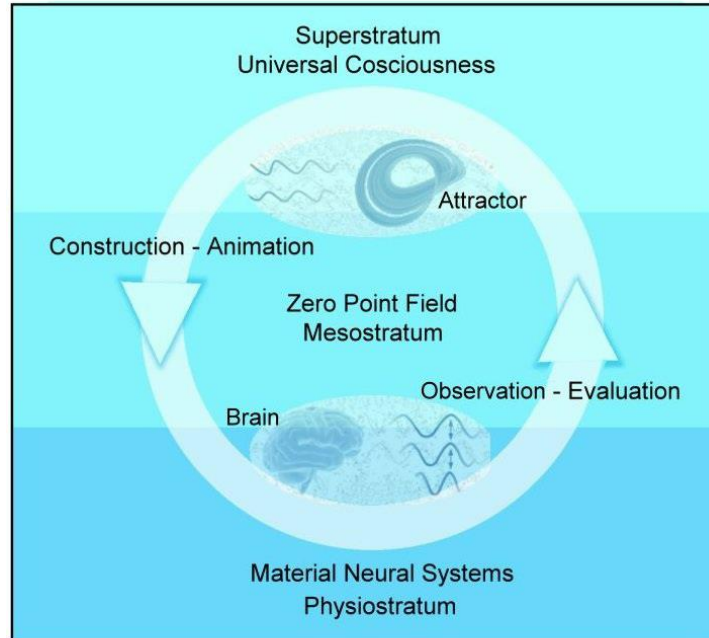


Figure 3 - ZPF attractor materialization cycle.

In Figure 3 the brain/mind functions as a detector that filters external electromagnetic stimuli, as when seeing or sensing physical surroundings. For example, the activity pattern on the retina, reproduces the frequency and intensity patterns of the stimuli. These are translated into nerve impulses that result in a characteristic stimulation of the cortex. This stimulation induces phase transitions where disorder becomes order and culminates in an attractor, a highly synchronized and coherent neural activity pattern, the formation and stabilization of which, according to Keppler, is orchestrated by the ZPF and transmitted to one's higher consciousness and which is ultimately shared with a universal consciousness. The interplay between the oscillating neural assemblies and the relevant ZPF modes results in a ZPF information states (a pattern of phase-locked ZPF modes) which are comprehended and realized by consciousness. In summary, a physical stimulus triggers a complicated translation process (a cascade of transformations) until it gains access to the fundamental level of reality, via the ZPF. Keppler elaborates on the ZPF substratum which he considers the primary reality from which all the material manifestations emerge as our tangible objective reality.

Keppler ZPF Attractors

Stochastic electrodynamic (SED) theory incorporates the concept that the universal ZPF substratum is a fundamental, all-pervasive stochastic energetic field which may be viewed as an ocean of energy that permeates the mesostratum. Joachim Keppler argues that stochastic modifications of the ZPF produce local states of order in the inherently chaotic disordered ZPF [2]. The quiescent ZPF exhibits no correlations between stochastic individual modes, while the locally coherent ZPF exhibits a phase-locked coupling of certain sets of modes. Such a phase-locking occurs whenever a mesostratum dynamic system reaches a coherent stable state - an *attractor* - whenever a system is in dynamic equilibrium with the ZPF.

The set of correlated modes depends on the resonance frequencies of the given system, so that the generated modifications (signals or wavefunctions) in the ZPF are system-specific information states peculiar to the physiostratum spacetime voxel states [3]. Accordingly, specific physiostratum spacetime voxels or groups of voxels (quantumthing gravitational agglomerations) undergo periodic transitions from a disordered chaotic to ordered phase - induced by appropriate stimuli such as mathematical objects, strings, wave functions, etc. in the mesostratum ZPF substratum.

In the ordered phase, the dynamics of loci in the physiostratum plenum assembly become attractors, i.e., the dynamics of an assembly reflects a state of synchronized activity and high coherence. Such patterns manifest as quantumthings and quantumthing agglomerations. In the background locus, due to the interaction with the ZPF, these activity patterns coalesce to populate the physiostratum milieu. The ZPF substrate is therefore an essential component of the mesostratum and fundamental to generating the content of the cosmos.

Akashic Field Theory

Ervin László in *Science and the Akashic Field* posits the Akashic Field, a field of information, as the substratum of the cosmos. We posit that the Akasha resides in the mesostratum - the fundamental energy and information-carrying field which includes the ZPF - and informs not just the universal consciousness (as depicted in Figure 2) but our higher consciousness of the past and present. We and László believe that the Akashic informational field explains why our cosmos appears to be fine-tuned so as to form habitable worlds hospitable to DNA and conscious life forms and why DNA evolution is an informed, not random, process.

The Gene Machine

At this point, lacking empirical demonstration or verification, we imagine a transcendent design process that constructed the primordial DNA molecule from resources available on a life-barren planets - such as the Earth - which formed from stellar eruptions and nebular debris strewn about the primordial cosmos which originated and emerged from a cryogenic ZPF substratum [4]. Such resources necessarily include the organic chemicals needed for constructing the DNA molecule as well as a quiescent habitable globular surface and a friendly climate - energized by the radiance of a stable star. All this comprises a base of operations that attracts the interest of Astrals inclined to populate the cosmos with life - wherever feasible.

The profound Akashic resources of the mesostratum, informed the Astrals, our putative designers. The Astrals devised genes to carry out a step by step plan for staging cell by cell, organism by organism, establishment of colonies of humanoids on Earth - and ostensibly elsewhere in the cosmos. Iterative procedures are required for goal-oriented biomechanical entities. If our human species or its progenitors were entirely devoid of entelechial or teleological oversight, then the question of intelligent design may be put aside as moot. Then gene and her cousins meme, epigene and allele may be granted chance origins - arising spontaneously from the dust of stellar debris that settled on Earth or some sister planet. It is more likely that her teleological template pre-existed her appearance as a biological entity. We surmise that the gene and her cousins appeared at the behest of creative industrious Astrals and

straightaway became instrumental in originating species and fostering their evolution in conformance with pre-existing templates in the mesostratum. We argue that the mesostratum, in effect, is a source of holographic templates for genes and derivative biological entities that may be projected into the physiostratum as depicted in Figure 1.

The gene is a mechanism, a device, that plays a pivotal role not only in human evolution but in the *origination* of the human and other species. The question of intelligent design reasserts itself because the gene is more than merely a dumb mechanism; it is intelligent, makes choices, provides instructions. Some form of the generic 'gene machine' has been around for a long time, preceding microscopic plants and critters that first sprung up in the primeval world. The priority of the gene machine's appearance is needed to prepare groundwork for *creating and feeding* simple and complex living matter. This leads to the question: 'what is the origin of the gene, how was it designed and programmed?' Surely, the gene did not design itself.

Our intimate relationship with the gene, our origin and its origin draws us inevitably into a quandary that demands resolution. We are reluctant to assert that we are here simply by chance. We are evidently here by design even if the design is implemented by the lowly selfish gene simply following a pattern of rules - rules that overcome entropy and bring order out of chaos - order that finds at least a provisional zenith in the human mind and its intellectual achievements. It is the patent existence of a pattern of rules that inevitably suggests a guiding hand outside the physical realm. That virtual hand reaches out of the mesostratum, as in E. C. Escher's celebrated Drawing Hands - each drawing its counterpart suggesting an overseeing creative intelligence - such as we assume resides in the superstratum.

Disquieted and Adventurous Astrals

Many, perhaps all, Astrals - spiritual occupants of the superstratum - have a strong desire to assume tangible form as living beings and are therefore inclined to design DNA-like molecules which ultimately form the living ambulatory vehicles which the Astrals may invest with a higher consciousness, their soul.

John, an Astral in the superstratum, exclaims in abject desperation, "This ethereal paradise is boring and apparently there's no hope of relief from all this enlightenment and eternal bliss!"

Sean, another Astral, experienced in and having fully enjoyed repeated incarnations, reassures John saying, "Your boredom will vanish when you plunge into the world of life and savor mortal existence."

John hesitantly says, "I suppose that I could enjoy mortal life, but fear I will then be in the thrall of much abuse, agony and pain interspersed with some pleasure and contentment."

"That's just the point, John, you enrich yourself and you contribute a grand work in progress by becoming a self-aware being albeit bound by space and time in one of the many worlds of the cosmos. The pleasure and pain are just part of the deal. You cannot appreciate one without the other. The dynamics of opposites and invigorating conflict allows you to build a repertoire that will amuse your soul as it ultimately idles in boundless blissfulness. You may even want to return to

another of the many material worlds to break the tedium you now complain of."

"Well, Sean, I admit I have peeked at various worlds and have gotten glimpses of some entertaining possibilities. Perhaps I should participate in worldly affairs, enjoy their occasional ambience, and tolerate any vicissitudes thrust upon me. I should then return to this transcendent paradise with an improved attitude."

"More importantly, John, your motivation should go beyond the benefits you glean for yourself. Rejoice in the glory of the feedback information and ideas you can deliver as you contribute to our collective life-generating work-in-progress."

At this point, Jean enters to counsel John who seems still undecided about incarnation in a messy world, "John, there are other options, if you'd rather remain in the spirit world. For example, there are openings in many different types of Astral occupations like in the Intelligent Design or the Epigenesis Bureau."

"John responds languidly, "Yes, I'm aware of the job postings. One that grabbed my attention announced the need to expand the staff of the DNA Genetics Bureau. I'm unclear about its exact nature and mission. It sounds highly technical and I am unsure of my qualifications."

"No need for concern." Jean counsels, "You will be trained as you do the job. Remember, You can access inexhaustible intellectual resources and instrumentalities which exist in the mesostratum Akasic Library. Jean continues, "The bureau's main project currently is to continue the original work of evolving the human genome. More human beings worthy of housing Astral consciousness and mediating spirits are needed. Although some satisfactory progress has been made, on Earth for example, there's still a need for lots of fine-tuning to improve the human genome for better communication with our transcendent supernal consciousness. Many salutary refinements have come to pass and continue fortuitously, by chance, by natural selection; but there is still too much randomness involved."

At this, Sean complains, "The whole process of evolution is literally screwed up because human societies have poor breeding practices. They tend to inbreed and remain disgustingly provincial. People often poorly nurture and poorly educate their progeny, they even toss away fetuses that may have great promise. Most distressing is that humans do not go about social and genetic engineering systematically and efficiently."

John's imagination is awakened, "I get it! The Astrals create, program DNA and genetic codes. They redesign and refine all kinds of ancillary, subordinate and intellectually dominant life forms. They build a huge library of successful, time-tested genetic codes. They fine tune the human genome and hope for the best. Although Astrals can't move mountains, they can easily fiddle with things at quantum, atomic and molecular levels."

"But, the rest is up to the sentient creatures they design," sighs Jean, "and hopefully each one, each tribe, each colony, each society will contribute to furthering the enlightenment and evolution of the species."

John decided to initially incarnate as an eagle so that he could savor a bird's eye view of the Earth's flora and fauna. After studying the remarkable 'blue planet' John wondered how it came about and how it became habitable and inviting to life and how it became an appropriate host for DNA.

DNA Environment, Origin, Expression

Preparing the DNA-World Stage

An Astral named Atlas is credited with discovering a molten ball of iron revolving around a main sequence star at a distance suitable for habitation. Atlas used the energetic resources of the mesostratum and nearby nebular dark matter to cover the ball with a cooler rocky mantle, thus creating Earth which now has an outer silicate solid crust, a highly viscous mantle, a liquid outer core, and a solid inner core. The inner core is probably composed primarily of iron and some nickel. It is not necessarily a solid, but behaves as a solid. The thicker crust is continental crust, which is less dense and composed of sodium potassium aluminum silicate rocks, like granite - igneous rocks that are relatively rich in elements that form feldspar and quartz and rocks which are relatively richer in magnesium and iron. Earth's mantle is the thickest layer of Earth. The mantle is divided into upper and lower mantle. The upper and lower mantle are separated by a transition zone. The mantle is composed of silicate rocks that are rich in iron and magnesium relative to the overlying crust composed of elements and compounds suitable for the emergence of living matter based on DNA.

An Astral named Gaia is credited for turning the Earth's surface crust into a homeostatic entity - a self-correcting biological system resisting change and to maintaining itself in a state of stable equilibrium. Gaia assured that living organisms on Earth will affect the nature of their environment in order to make the environment increasingly suitable for life. Gaia anticipated that a life-giving planet must regulate its biosphere in such a way as to promote its habitability and the connection between the survivability of species, their evolutionary course, and the symbiosis among species. This includes the thousands of millions of years over which vast oceans formed and coal, oil and gas deposits formed to support populations of diverse living matter and to support the energy needs of advanced civilizations.

Fossil fuels were formed from plants and animals that lived over 300 million years ago in primordial swamps and oceans. Over time the plants and animals died and decomposed under tons of rock and became buried under many layers of mud, rock, and sand. Oil and natural gas were created from organisms that lived in the water and were buried under ocean or river sediments. Long after the great prehistoric seas and rivers vanished, heat, pressure and bacteria combined to compress and cook the organic material under layers of silt. In most areas, a thick liquid called oil formed first, but in deeper, hot regions underground, the cooking process continued until natural gas was formed. Coal formed from the dead remains of trees, ferns and other plants that lived 300 to 400 million years ago.

Astral Gaia established La Niña an ocean-atmosphere phenomenon coupled with an opposite phenomenon El Niño as part of global climate readjustment pattern. La Niña and El Niño impact the global climate and influence weather patterns, which occasionally lead to intense storms in

some places and droughts in others. El Niño is associated with annual weak warm ocean current that running southwards along the coast of Peru and Ecuador and the warming of the ocean surface or above-average sea surface temperatures in either the central and eastern tropical Pacific Ocean associated with a band of warm ocean water that develops in the central and east-central equatorial Pacific including off the Pacific coast of South America. La Niña causes mostly the opposite effects of El Niño, such as above-average precipitation across the northern Midwest, the northern Rockies, Northern California, and the Pacific Northwest's southern and eastern regions.

An Astral named Saturn is credited for establishing the food chain which sustains all living matter. Saturn set down microbial mats consisting of multi-layered, multi-species colonies of bacteria and other organisms, containing a wide range of chemical environments, each of which favors a different set of microorganisms. Each group of mats to differing degrees forms its own food chain and the by-products of each group of microorganisms generally serve as food for adjacent groups. Astral Saturn anticipated the need to envelope the Earth with oxygen for stages of evolution that produced oxygen-breathing mammals and humans.

The oxygen is necessary to accommodate the metabolism of food by the post-primordial DNA-based creatures. Consequently, oxygen became a significant component of Earth's atmosphere. There was a significant time interval between the appearance of oxygen-producing organisms and the oxygenation of the atmosphere. Oxygen was first produced somewhere around 2.7 billion to 2.8 billion years ago and became 21 percent of the atmosphere around 2.45 billion years ago. This is balanced by roughly 0.04 percent by volume of atmospheric carbon dioxide currently needed to globally sustain green plant life. Astral Saturn maintained the carbon dioxide level at over 0.20 percent during much of geological history in order to proliferate the plant growth needed to jump start and advance animal life.

The Astrals assembled a fairly stable and life-friendly environment on the Earth despite having to tolerate occasional volcanic eruptions, earthquakes, tsunamis, hurricanes, etc. besetting the planet - which has not yet become geologically quiescent.

Primordial RNA and DNA

After Astrals decided to populate globular habitats like the Earth with living creatures and humanoids, they immediately assembled and trained spiritual bureaucratic hierarchies and staffs of Astral genetic engineers. Dormant design processes in the mesostratum Akasic Library were found and activated. The procedure could not be arbitrary or left to chance; it was organized and systematic. The primordial DNA quite literally had to 'hit the ground running' and it did - after a number of intermediate starts.

Astrals initially introduced a three-domain biological system that divided primordial cellular life forms into archaea, bacteria, and eukaryote domains. The system emphasized the separation of prokaryotes into two groups, bacteria and archaea. On the basis of differences in their rRNA genes, these two groups and the eukaryotes each arose separately from a progenote ancestor with poorly developed genetic machinery.

Even the simplest members of the three modern domains of life use DNA to record their

encodement and a complex array of RNA and protein molecules to read the encodement for growth, maintenance and self-replication. Some RNA molecules can catalyze both their own replication and the construction of proteins so that the earliest life-forms were based entirely on RNA. These ribozymes initially formed an RNA world in which there were individuals but no species. As mutations and horizontal gene transfers occurred the offspring in each generation were likely to have different genomes from those their parents started with. RNA was later replaced by DNA, which is more stable and therefore can build longer genomes, expanding the range of capabilities a single organism can have. The original ribozymes still remain as the main components of ribosomes, the protein factories of modern cells.

RNA is quite complex and is not observed to be produced non-biologically. However, some clays, notably montmorillonite, have properties that make them plausible source for the emergence of the primordial RNA-based world. They grow by self-replication of their crystalline pattern and they are subject to an analog of natural selection, as the clay species that grows fastest in a particular environment rapidly becomes dominant. Moreover, they can catalyze the formation of RNA molecules. Astrals may have seized on this prebiotic origin of RNA to advance towards our DNA-based world. DNA can be considered as a modified form of RNA and the synthesis of DNA building blocks from RNA precursors is a major Astral accomplishment.

The 'first' organisms with a modified RNA - that is primordial versions of DNA (U-DNA and T-DNA) - were successfully selected against the more primitive organisms of that era. The Astrals concluded that the possibility to have a large genome or to repair cytosine deamination could not be realized in that 'first' organism and that efficient DNA repair and replication proteins able to replicate large DNA genomes must be present. In order to solve this problem, the Astrals arranged the first appearance of U-DNA in a virus, making it the first DNA organism resistant to the RNA dominance of its host.

After DNA replication and repair mechanisms were assigned to viruses, enzymes of viral origin were used to correct cytosine deamination - and the enzymes were later on transferred to cells, a prerequisite to establish the selective advantage of DNA cells over RNA cells in term of faithful replication. The transfer of a DNA genome from a virus to a cell subsequently eliminated the labile RNA genomes. DNA origination in viruses leads to DNA replication systems which emerged and evolved independently from different lineages of RNA viruses. This allows for a long period of DNA replication evolution purely in the viral world. The Astrals apparently exploited this phenomenon to achieve different version of DNA replication proteins.

Up to now, the study of DNA replication has still not revealed the origin and evolution of this pivotal cellular mechanism. The central role of RNA in both the origin of life and the mechanism of protein synthesis only partially explains how the Astrals achieved these evolutionary constructions. The same is also true for DNA transcription. We can tentatively conclude that viruses have played a major role in the origin and evolution of the DNA replication proteins and possibly of DNA itself.

DNA as Observer and Informer

Our DNA-based embodiment is primarily a survival machine, an automaton, with no inherent

need for self-analytic consciousness. It is a communal super-colony consisting of trillions of cells. The evolutionary push for evermore complex communities of cells reflects the biological imperative to survive, to control and to make better use of the environment. Complexity leads to more awareness, that is, to a greater capability to react and adjust to the environment and thence to improve the probability of survival. When cells band together, differentiate, organize and communicate, there is an exponential increase in the organism's global self-awareness and ability to adjust to environment and change. Over time, this pattern of differentiation - the distribution of the workload among the members of the community - became embedded in the genes of every cell in the community - communicating and significantly increasing the organism's efficiency and its ability to survive. A command center, the brain, governs the super-colony and its ambulation and responses to chance events, environmental confrontations, and struggles with choices that need to be made.

Our embodiment - our DNA-based vehicle - of our transcendent consciousness - is apparently the product of evolution over millions of earth years - adapted and refined to endure, manipulate, and enjoy earthly habitats. Our consciousness embodiment perhaps has no inherent human-like consciousness. Nevertheless, our survival machines are somehow programmed to respond to and survive their environments, to replicate and evolve, without any urgent need to assume human consciousness or engage in intellectual social intercourse. Of course, they possess an operational self-awareness and self-identity.

An amoeba or paramecium may well possess these all these attributes but one: the ability to 'see' to observe, analyze, and to manipulate and alter parts of the of the objective reality in which it is immersed. As depicted in Figure 4 our DNA was encoded to differentiate cells that produced an organ for seeing: the eye, retina, optic nerve, and associated neural system. Thru our eyes our DNA informs itself and, as indicated in Figure 3, provides information to the supernal consciousness and to the ZPF attractor materialization cycle and the Akasic Field. We credit the Astrals for this adjunct to our higher consciousness.

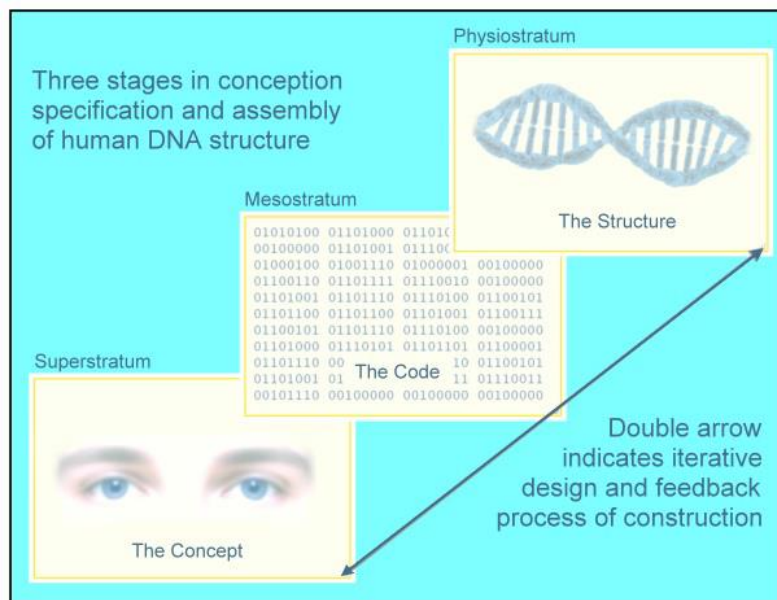


Figure 4 - Illustration of essential stages in DNA construction.

Expression of Information in the Human Cell

The information and instructions putatively stored in DNA is astronomic. We estimate that one human DNA molecule contains enough information to fill a million-page encyclopedia. This information is presumed to construct and control the functions of the human body. Were one piece of information be read every second, it would take 100 years to complete the process. Calculations have revealed that the DNA encyclopedia contains some 3 billion different subjects. A molecule of DNA - a piece of matter that is about 46-50 nm in length and 2 nm diameter and made of protein, fat, and water molecules - apparently holds this vast amount of information. It is astonishing that this infinitesimal piece of matter should contain and store so much information. Putatively each one of some 100 trillion cells in the human body contains one million pages of information. Remarkably, the cell uses this information quite flawlessly, in an exceedingly well-planned and coordinated manner, in the appropriate places, virtually without making errors. Moreover, just after conception, the original fetal cell has already begun the process of building the human body.

All the cells in the body have the same DNA and yet they are not identical, even in the same shared organ. Each originates from a common starting point: a fertilized egg. But, each organ cell type is completely dissimilar to that in another organ, and other cells in the same organ, and totally different from the original fertilized egg cell. For example, the retina contains two types of photo receptors, rods and cones - some 120 million rods and 6 to 7 million cones which provide the eye's color sensitivity and are concentrated in the central spot known as the macula. Theory holds each cell - whether a neuron, skin cell, or a photo receptor cell - uses genes that it contains differently. All cells have the same set of genes (~20,000 in humans) but it is up to the individual cell whether each gene is turned on or off - that is *expressed*. A gene can be described as a region of DNA that can undergo transcription to produce a corresponding RNA intermediary, which can then be translated into a specific protein molecule. The proteins determine the activity and function of the cell. The control of protein expression through regulation of each gene is of fundamental importance.

By either enhancing or repressing the expression of each gene, a cell can become highly specialized. For instance, a neuron has absolutely no need for rhodopsin, a protein involved in light-sensing. In the photo receptor cells of the retina however, rhodopsin is integral to the cell's function, so its expression will be greatly enhanced. Conversely, neurons require very high expression levels of specific ion channels, such as the voltage-gated ion channel, but these genes will be repressed in photo receptor cells. In essence, for each gene in each cell there will be differing levels of expression according to the conditions around the cell, signals received at the cell surface membrane, and the specific cell type (determined during development of the embryo). It is through this process that the function and morphology of each cell is unique.

The Mesostratum Template

The Human Genome Project has provided us only with a glimpse into how human biology works. It shows us all of the possible proteins in each cell, but understanding the expression patterns of individual proteins in different cells remains unresolved. As depicted in Figures 1,

3, and 4, we conjecture that the mesostratum is the ultimate energetic reservoir and source of information, potentialities, codes, and life cycles templates attributed to DNA. In this context, the DNA molecule, the genome, the genetic material of an organism is simply the physiostratum realization of a mesostratum encoded superstratum concept - drawn from the Akashic field and formulated as a ZPF attractor. Material evolution of the genome is then the result of a design, feedback, and iteration cycle which requires the structuring of an objective material reality and its interaction with a governing supernal consciousness, as represented in Figure 3. The DNA macromolecule is pivotal as an antenna and transmitter of signals inherent to the process. DNA by itself is apparently unable to regulate its own genes. We are finding that at the molecular level the organism is so dynamic, so densely woven and multidirectional in its causes and effects, that it cannot be explained as a purely *local* process.

The cycle depicted in Figure 3 explains how DNA, which is composed of the arrangement of huge numbers of unintelligent atoms arranged in certain sequences, and enzymes (or RNA in RNA viruses), working in a harmonious way, is able to organize countless complicated and diverse operations in the cellular structure and dynamics of the body. The wisdom and information is not in the DNA molecules or in the cells that contain them, but in the universal consciousness - and presumably in the Akashic Field - that brought these molecules into being, programming their life-cycles and guiding them to function as they do.

Conclusion

Are we, our habitats, our worlds, satisfactory works in progress functioning as intended by our designers? Obviously, we are imperfect beings in an imperfect world and may well be discardable models requiring further iterative design, development, and evolution. The replacement of unwieldy lumbering dinosaurs with emblazoned birds and fish and other land and sea species was probably done upon reconsideration of designs appropriate for Earth during its rehabilitation following the devastation wrought by an asteroid millions of years ago. Ultimately, we may build beautiful machines, indeed proxy humanoids, that surpass our biological limitations and which our brains, spirits, souls, and consciousness will be eager to occupy [5].

Our intimate relationship with DNA, our origin and its origin, draws us inevitably into a quandary that demands resolution. We conclude that, although it is pivotal, DNA operating alone cannot account for the complexity of living matter, the cycles of life, or their origin. We are evidently here by design and governed by rules that overcome entropy and bring order out of chaos - order that finds at least a provisional zenith in the human mind and its intellectual capacity and achievements. It is the patent existence of a pattern of rules that inevitably suggests a guiding hand outside the physical realm. That virtual hand reaches out of the mesostratum, like E. C. Escher's celebrated Drawing Hands with each of two hands drawing its counterpart. As with all art, there is an implicit overseeing non-local creative intelligence.

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