ТЕОРЕТИЧНА КУЛЬТУРОЛОГІЯ

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CREATIVITY: A PERSONAL VIEW

The meaning of creativity is an illusive concept and highly subjective. This article focusses on four strands (curiosity, illusion, execution and innovation) and weaves them into a tapestry that represents the personal view of the author. An innovative hypothesis is that creativity is related to the bicameral mind and this is backed by reference to current neuroscientific research. The author is by profession a mathematician but posits in the article that at the micro level there is no difference between Art and Science regarding the act of creation. The article discusses this process from four different angles; curiosity, illusion, execution and innovation. The final synthesis is left to the reader.

Key words: Bicameral Brain, Constructivist theory of the brain,Creativity, illusion, innovation.

Formulation of the problem. The idea being explored is that of the creative process. The author believes that Homo Sapiens consists of "embodied minds" and hypothesizes that there are strong links to creative actions and the latest published neuroscientific research on the bicameral mind. There is a myriad of approaches that could be taken but the author looks at the subject area through the lens of a prism. The four faces of this prism allow "creativity" to be examinedunder the four facets of curiosity illusion, execution and innovation. It is left to the "creative mind" of the reader to synthesis these personal observations and form their own view of the process of creative actions.

Analysis of research and publications. The article is supported by research in several areas. Barrett andMcGilchrist are leaders in latest neuroscientific research on how the brain functions and the article also refers to the controversial views on the birth of consciousness by Jaynes. There are philosophical references from Heidegger and Durham. Smolin is a leading quantum physicist with strong views on creativity in ScienceThe views of esteemed artistic commentators such as Koestler Anderson and Perricone. Finally, the innovative fusion of Science and Art by Christian Bok is referenced in the article by Tanburri.

Purpose of the article. The purpose of this article is to explore the meaning of the "creativity". To do so, the author uses neuroscientific ideas of the embodied mind and the bicameral brain. The views expressed are personal ones and some will be regarded as controversial by the readers. This fulfills the second purpose of the article to stimulate debate in this important area. The authors email address is available, and all comments would be welcomed.

Exposition of the main material of the study.

1. Introductory ideas

The essence of human existence is not be found in space and time but in the "experiencing of experience "which Heidegger calls "dasein." Our being is the totality of our existence at any instant of time. [4] This article is about one feature of human existence – creativity. I do not distinguish between creativity in Science and Art. These two cultures are not independent but form a complementary and intersecting oneness. The following definition could apply to both:

> *a complex and dynamic intellectual endeavour rich with creativity, innovation, alert and responsive to public concerns and curiosities and deeply implicated in religious and philosophical debates that have given vibrancy to history.*

I am distinguishing here between Science and the Scientific paradigm which is a methodology,using logical, precision and rationality, developed by scientists for "doing science". The paradigm claims to beobjective in the sense that every experiment should be repeatable and independent of the experimenter who is outside the system. But, in itself, the paradigm is subjective as it is the agreed consensus of the time. This ambiguity reveals the non-linear accumulation of knowledge which is a Hegelian dialectic between objectivity and subjectivity.The Scientific Paradigm has been brilliantly successful and the technical age we inhabit is due to its success but is not the focus of this paper.

Science and Art both involve reason to create meaning as opposed to devolving explanations, meanings and causes to supernatural beings which are personalised in the concept of a God (or Gods). This is a excuse to absolve Homo Sapiens from responsibility for their actions and reduce their control of their destiny to a propitiatory and worshiping one., Religion can provide meaning to existence butbycreating an escape route- a meta-entity which then itself needs a meaning.

Although both Science and Art attempt to find "meaning", there is a difference. Science associates "meaning" with explanation. It is impossible without faith. Faith not in the religious sense but faith as the belief that nature can be explained. Nature is not like the croquet game in Lewis Carroll's "Alice in Wonderland" where the balls are hedgehogs, the players can walk away at any time and the rules are made by a capricious queen. Science believes that nature is passive in the Augustinian sense – that its difficulties in understanding lie within the human mind. Nature is not directed by ancient gods who deliberately hide its behaviour or change it to confound mankind, which is the Manichaean view. To quote Einstein: "*God maybe subtle but he is not mean*" Scientific explanations provide the opportunity to create the modern world, but deeper meanings are still hidden. Maxwell's laws explain Electricity and magnetism, Einstein's space-time explains gravity, Darwin's theory of evolution explains how species have developed but these explanations are not complete. Science cannot explain what an electromagnetic wave is, or a graviton or why evolution is regulated by the Darwinian survival mechanism. Great scientists (Einstein, Bohr, Heisenberg) realise that buried beneath the building blocks of scientific explanations, there really does exist an innate unity and beauty, a hidden poetry, a message that we could read if we had the means to understand it. It is here that Art plays a role and give meaning when Science cannot. This is the sense of a "complementary and intersecting oneness".

2. The Creative Process

The brain plays a major role in any creative activity, so it is worth a brief digression into neuroscience.Recent research seems to favour two hypotheses of how the brain functions:constructivism and the bi-cameral brain. Their primary importance for this article is not their veracity but the fact that they have inspired and stimulated my thinking. The classical view of the brain (known as the Triune Model) assumes that the brain reacts to its environment by matching preformed internal concepts against external perceptions and that there are specific parts of the brain that control (or are strongly influential) in controlling specific feelings. This concept of hard-wired knowledge is currently being researched by constructivist theories. Thesetheories share the belief that perceptionsare not mechanically acquired, but actively constructed by the brain. All sensory information (whether it is internal i.e. from body parts or external i.e. from perceptions) is a massive changing puzzle for the brain to solve. Both internal and external inputs involve continuous sensory signals that are highly variable and ambiguous as they reach the brain. To make sense of this, the brain to predicts them before they arrive, fills in any missing details and find regularities (where possible) so that one experiences a world of objects, people, music and events not the blooming buzzing confusion that is really out there. Thus, the brain **creates** "perceptions" to make the sensory signals meaningful, providing an explanation for where they came from, what they refer to in the world and how to act on them. These perceptions are so vivid and immediate, that they cultivate the belief that oneis experiencing the world *as it is*rather thanthe personal one constructed by your brain. All thatisperceived and therefore experienced as the outside world is inside the brain. [2] There is a common saying "Seeing is believing." Constructivists insist that it is the opposite that is true. "Believing is seeing." You canonly see what your brain believes. This is a completely counter-intuitive view of reality. Its implication is that "meaning" is subjective. The scientist and the artist are presenting their own inner struggle and resolution (mental model) which have to reconciled with the observer's own mental model. It is this tension between the two that provides the opportunity for emotions such as awe, wonder and beauty which are associated with the creative act.

The second research activity concerns the peculiar structure of the brain itself. There are obvious restrictions on its size as it is constrained by the geometry of the human skull, but its shape is intriguing. It seems to be two hemispheroidal shapes (called right and left) bound together by a band of nerves called the Corpus Callosum. Another name for this is the bi-cameral brain. By studying people with split brain disorders, it seems that in the right hemisphere, the emphasis is on experience, emotion, and the nuances of expression (implicitness). The left hemisphere takes a mechanical view, assembling disconnected, disembodied parts which are relatively distanced from human feeling, explicit, lacking in empathy and insight. [7] The left hemisphere is always searching for deep hidden structures in the world and assumes that his can be done through rational thinking. The right hemisphere is to attempt to capture the experience,relating individuals into the context of changingunified whole.The research also suggestsis that these functions are asymmetric -at any one time, one of the hemispheres is the master and one the follower. [7]

The oldest of our senses, "touch." is primarily governed by the right hemisphere. More brain space in the somatosensory cortex is given to the hand than any other part of the body and fingers have a high density of touch receptors compared to other body areas. [8] The enjoyment of the sexual act is primarily tactile, and we have a tactile imagination. Good art or science stimulate awe and wonder which are often displayed by piloerection (goose bumps). These are right hemisphere experiences. We use metaphors such as "to grasp our attention", "to causefeelings", "the experience was spine tingling."

The theory of colour provides an example of how the two hemispheres view reality.The Scientific explanation is that white light s composed of seven different primary colours each with a unique wavelength. In Science, there is no colour "black" just the absence of "light". Although this theory explained the phenomenon of rainbows, it is counter to our intuition and certainly a product of the left hemisphere. Goethe violently disagreed with the scientific theory. Colour is not a property of light; it is constructed in the brain. We experience different colours. They belong to the right hemisphere., It impossible for any physical combination of individual colours to create the colour "white". "Black" IS a colour in its own right – derived from carbon-based elements. All pictorial artists know this, and their creativity is in how they use these paints to create meaning.

Homo Sapiens is a social animal and, as such, certain common views are shared for social cohesion. This research implies that "truth" and "meaning" exist solely in the brain. Thus, there are two tasks for the artist/scientist: an internal search to discover through personal experiences a meaning and then an external search as to how this meaning can be represented. This could demand a third search to create new means of representation (new theories, new materials, new artifices) The "truth" of the final product is the acceptance of peers not an intrinsic quality. As such, the creative search will always continue.

Science and Art straddle both worldviews. Their starting point is always in the experience (right hemisphere) but the left is needed to a greater or lesser extent. Many great works of art could not have been produced without the help of the left hemisphere. (architecture, perspective, geometry) and many great scientific insights came from the right hemisphere – the world of experience.

3. Some aspects of Creativity

There are so many ways to approach "creativity" that a lens is needed to provide a framework for my observations. Copyingthe famous experiment when Newton shone light through a prism to find its constituents, I have chosen a prism – the tetrahedron for my lens. The tetrahedron (the simplest of the platonic solids)is the smallest space that can be enclosed by triangles which themselves are the simplest shapes that can be constructed from straight lines.) We are all "embodied minds" with an in-built, natural awareness of space. "*Geometry is all*" said Plato, so it is satisfying for me to use a geometrical analytical tool.I designate the four faces of the tetrahedron to represent Curiosity,Illusion, Execution and Innovation. One can never describe a "thing" without describing its parts yet describing its parts (however well it is done) never captures the essence of the "thing". With this caveat in mind, I wish to discuss these four aspects of "creativity." I leave it to the "creativity" of the reader to synthesise these thoughts and create their own meaning frommy words.

3.1. Curiosity

Man is a curious animal – a problem solver. The creation of tools is a distinguishing feature of his development. The creative aspect of a tool occurs when an object is seen as a thing in itself and also as a thing that can be used for a different purpose. They share a common pattern which Koestler terms "bisociation" – a blending of elements drawn from two previously unrelated matrices of thought into a new matrix of meaning by way of a process

involving comparison, abstraction and categorisation, analogies and metaphors. [6] The left hemisphere breaks the oneness of the right hemisphere by classifying, by compartmentalising knowledge, creating artificial constructs. Science and Art can be regarded as tools of discovery which have their origin in the right hemisphere.

The development of language matches that of tool creation (there are different hypotheses as to which caused which) and, as a means of communication, has been maybe the dominant factor in civilisation. However, there is a downside to language. Words are created to portray meaning but this meaning is often a highly abstracted version of the experience. For example, many of the problems concerning the acceptance of the Quantum theory were caused by using words with an agreed meaning (such as spin, velocity, position) in a new circumstance. Difficulties occurred as the ideas represented by these words were different. A similar problem occurs in the Economics. Words such as "price", "productivity", "supply" and "demand" are concepts that have their origin in the right hemisphere but have been heavily abstracted by the left, stripped of all qualities When something is written down it becomes fixed. A barrier is created. The search for ways to break down these boundaries and connect different meanings is an importantaspect of creativity. This is one of the features of poetry which is a creative play with words and in so doing provoking new perceptions.

A controversial corollary to the bicameral theory is the hypothesis put forward by Jaynes' [5] which gives an evolutionary account of the conscious mind. Jaynes precisely defines consciousness as self-awareness – a conceptual, metaphor-generated inner world that parallels the actual world. His claim is that human self-awareness arose from the power of language and the ability to make metaphors and analogies. Metaphors of "me" and analogous models of "I" allowed consciousness to develop through introspection and self-visualization. There are two explanations to the rise of self-awareness. Jaynes argues that in prehistory, the right hemisphere dominated the bi-cameral mind and that there was a merger of the wo hemispherical views to v create the modern mind. The other explanation is entirely the opposite in that the brain became more apart. Phenomena that were previously uncomplicated experienced as part of a unified consciousness now became separated. Intuitions became themselves objects of study and objectified. The concept of "mine" did not previously exist as one was part of the whole but now the left hemisphere was able to detach(abstract) it from reality. Both hypotheses agree that consciousness is only part of mental activity and is not essential for sensation, perception, concept formation, learning, thinking or even reasoning. Jayne hypothesises that there were, at one time, human beings who did most of the things we do – speak, understand, perceive, solve problems, create art – but who were not self-aware. Its emergence had a profound effect on creativity in the arts and sciences.

If one examines the statuettes of ancient time, many are not individualised, concentrating on the sexual or physical aspects of humans. Jaynesattributes this to a lack of self-awareness which he equates with consciousness. [7] The artwork on the walls of the tombs of the pharaohs is dazzling and masterful but the representations (animals, gods and all human figures) are identical – there is no personalisation. The Pharaoh is indicated by his size. The death mask of Tutankhamun is recognised as an example of a great creation, but it does not portray the buck-toothed boy that his mummy has revealed. It could have been placed on any pharaoh's sarcophagus. The meaning of their art was in its execution. Even today, one could not improve on the death mask or rival the Palaeolithic cave paintings. This lack of consciousness did not prevent the building of societies and civilizations (the Near East, Egypt, Southern Africa, India, China, Mesoamerica) which were developed by commands attributed to Gods and other rulers – i.e. external "authorities" using various symbols, such as graves, temples, and idols.These examples could also be seen as products of the left hemisphere which places individuals into categories and focusses on analysis. Jaynes advances the theory that this focus was gradually directed inwards (to the person) and there was a transition to self-awareness. When, and over which period, this transition to the conscious mind occurred is an area of debate. Jaynes associates it with the collapse of the bronze age culture around 1000 BC and the eruption of Thera which destroyed the Minoan culture. Others posit a more gradual decline. Self-awareness m has an important role in the creative process. With no consciousness, there is no inner angst on the part of the artist. They are at the command of their gods. To me, such work can be wondrous but, in its execution, rather than in its essence.

It is interesting to analyse the work of Homer. In the Iliad (written around800 BC) theactions of the heroes are determined by the gods.There is a lack of individualisation. The Odyssey (which was around 700 BC) deals with the journey home after the fall of Troy. It is a different style of writing where the hero (Ulysses) is very much an individual who makes decisions.It seems that there the RH was assuming a more important role. A few hundred years later we have Socrates, Aristotle and Plato who are using their minds to reason and question nature. The gods have been silenced. Men are learning to abstract from the experiential world. This is a left hemisphere feature. Language has developed and can be written down. The drama of Aeschylus and Aristophanes depict situations that mirror those of the audience. The Greek Chorus are introduced, but they all wore masks. They were not individuals. We have the beginnings of objectivity. Instead of living life, we are observing it. One thinks of Shakespeare "*All the worlds a stage and all the players actors*" This LH dominance remained (the dark ages) till the next rise of creativity exemplified by the Renaissance.

3.2. Illusion

Our natural curiosity drives our search for meaning both in the arts and the sciences, but all meaning is eventually shown to be an illusion. Science does not set out to create an illusion, its explanations are attempts to further understanding whereas art is more aware of the illusion of meaning. A skill of drama is to create a suspension of belief where the spectator can identify with the role the actor is playing whilst being aware that it is actor on a stage or in a film. This ambiguity, this tension is one source of creativity. The extent to which the natural empathy that humans feel for other humans is manipulated is the mark of a great dramatist. To do this, the dramatist must also relate to the feelings of the audience so there is a three-way creative process taking place – an identification of a relevant emotion, an internal resolution of tat emotion and the re-presentation of that emotion in a way that absorbs the spectator. The continued popularity of Shakespeare's plays is that he has succeeded in all three aspects of this process and Hamlet's doubts on the meaning of life are as relevant today as the 16th century and indeed one often overlooks the fact that Hamlet never actually existed.

This raises the concept of truth. Science has often been thought to be the search for truth, but this needs to be examined in more detail. A scientific (mathematical) truth exists in the sense that the result is consistent with theory,

but, here, all variables have been stripped of any experiences or emotions. In this sense, science and its "truth" is tautological as it is "proving" what it defines as "truth" It has no compulsion to accurately mirror reality. The fact that it does so is an area of research in itself. David Hilbert defined mathematics as "*moving meaningless symbols around according to certain roles*" Is art about the idea or about the idea that the scientist has about the idea.

The "thinkability" of an idea depends on what is in the brain of the thinker. Knowledge and meaning becomes less about truth but about the examination of the idea. There is a structural instability between an idea and what the idea represents. Can one hear "wind." One can hear "wind in trees", "wind in chimneys", wind in the countryside" but these are only the effect of the wind. In a Jackson Pollack painting, it is the dripping paint that produces the meaning not the artist. Manet tried to capture the "truth" of ripples on a pond, Van Gogh tried to paint nature in its "true" essence, Camus and Kafka tried to show the absurdity of truth. An interesting concept is that of be-ables. According to Bell [3] and Smolin, [9] in Science, it should be possible to say "what is" rather than merely "what is observed". As Deschamps famously said "Cecin'est pas une pipe." This is all very well but – quite apart from philosophical arguments questioning the notion of a noumenal world -experimental observations continue to confound the realists. The quantum notion of entanglement (where particles can instantaneously affect each other regardless of distance) directly contradicts common sense. It seems that meaning exists independent of the human. The more we discover; it seems the less we know. The study of space shows that it does not exist – it is part of a four-dimensional abstraction called space -time. The current theory of an atom is that it consists of quarks which have no mass or physical properties. To quote Asimov

> *"scientific knowledge has fractal properties, that no matter how much we learn, whatever is left, however small it may seem, is just as infinitely complex as the whole was to start with. That, I think, is the secret of the Universe.*

In painting, there is also the illusion created by space. Piero della Francesco made a creative leap when he challenged the notion that three-dimensional representations could not be made on a two-dimensional canvas. His book "On Perspective in painting" is the earliest and only pre-1500 Renaissance treatise solely devoted to the subject of perspective. [1] It is also a good example of a synthesis between science and art as the book relied heavily on mathematical ideas. This curiosity concerning dimensions was also demonstrated by Dante two hundred years earlier.In his great work, the Inferno,he described two spheres -one for God and one for the people but wanted to connect every person directly with God. To solve the problem, he made a totally creative and mental leap of joining every point of two three-dimensional spheres to make a four-dimensional manifold which wasn't discovered by mathematicians till seven hundred years later. Another illusionary technique is to present different perspectives in the same painting. David Hockney's "Pearblossom Highway no 2" shows a road from both the drivers and the passenger's perspective to form an interpretation of what we see.

The French scientist, Chevreul studied Newton's thoughts on the mixing of light, and found that if two colours are placed next to each other, from a distance they give the illusion of a third distinctive colour. Also, the juxtaposition of primary hues next to each other create a far more intense and pleasing colour. The artist Seurat adopted these ideas to create pointillism which.is a technique of painting in which small, distinct dots of colour are applied in patterns to form an image. He believed that a painter could use colour to create harmony and emotion in art in the same way that a musician uses counterpoint and variation to create harmony in music. Viewed up close, his paintings are just a jumble of dots but from afar they create beautiful illusions of reality. The same can be said of the impressionists whose illusions are from a distance and lose their meaning when viewed up close.

3.3. Execution

My view is that Science and Art have always been concerned with attributing meaning to reality and as the view of reality has changed, so have they. In the visual arts, one can trace an unbroken line through all the "isms" when the artist looks to his inner self to find his meaning before the creativity of the second stage is needed to convey this meaning to others. This aspect of creativity, that can be observed in any trade, is the skill of its execution. It is most pronounced in the performative arts. The power of oratory and rhetoric is not as potent in today's world but can still resonate when done well. As an Englishman, my hairs still tingle when I hear a great natural orator such as Richard Burton or Lawrence Olivier speak their lines or read great poetry.A drama rests as much on the skills of the actors as the text. Modern variations on this theme are Pirandello's "Six Characters in search of an Author" and Woody Allen "The Purple Rose of Cairo." Great poets experiment with juxtapositions and combinations of words as well as the intricacies of rhyme and rhythm, metre and parsing. The most frequently encountered metre of English verse is the iambic pentameter, used by Shakespeare. When the already deaf Beethoven conducted the opening performance of his sublime fifth symphony, it was a disaster. It needs to be executed well under the expertise of good conductor to achieve its full splendour.

One looks at the portrait of Phillip IV by Diego Velasquez andis awe struck by the personal mastery exhibited in the painting. I would argue that the executionary aspect of creativity can be distinguished from the inner struggle. And that Velasquez's genius is displayed in the execution of the painting.I have creative ideas but have never produced a great painting. How does one transfer an idea to a flat surface? The size of the surface, its shape and what is made of are crucial decision. Leonardo was experimenting a new technique which unfortunately is susceptible to decay. The next decision is the choice of paint – watercolours or oils and then which colours are available. One forgets that in this age of plenty how difficult it was to obtain colours. All these decisions are made before the actual transfer onto the surface begins. These skills range from Velasquez's precision to Jackson Pollacks dripping paints. Curiosity alone is not enough to produce a creative genius. A careful study of their lives reveals that their curiosity was aligned to meticulous and continuous application. "Fortune favours the prepared mind." Current research shows that it takes an average of ten thousand hours of practice to master a skill. It is at that stage, that a fortuitous turn of events or thoughts can "create" The ten thousand hours of experience is needed here This whole process is part of "the creative act".

An overlooked creative activity is that of a comedian. Comedy has roots back through all recorded history. The

sudden bisociation of an idea or event with two habitually incompatible matrices will produce a comic effect, provided that the narrative, the semantic pipeline, carries the right kind of emotional tension. When the pipe is punctured, and our expectations are fooled, the now redundant tension gushes out in laughter. [6] This has all the aspects of creativity discussed so far. There is a creative tension. Two previously unthought of events are put together to produce a new situation. But what is also important is the skill of the comedian. He must have what is called a good sense of timing. He first of all has to create with his words and actions a known situation and then burst the tension at exactly the right moment. How many good jokes have fallen flat because of the poor executive skills of the joke teller?

Similar bursts of created tension (though not accompanied by laughter) occur in great literature. I can remember the moment when I was struck dumb as Maxim de Winter announced that he has murdered Rebecca in the novel by Daphne du Maurier. Similarly when Lorna Doone was shot and Jayne Eyre jilted at the altar.

3.4. Innovation

Innovation is regarded as a key ingredient of creativity, but it is an elusive concept. It is a paradox that a creative act need not be creative in the sense that many "creations" are not new but the reassembly of old facts As newton remarked about his work *"I have stood on the shoulders of giants*" If, as believed, all perceptionsare created anew in the brain then there is continual innovation taking place. Every time one cooks an English breakfast, one is innovating as the breakfast is new -it didn't exist before. Let us examine the meaning of two words:"New"which means a fresh version of a known thing and "novel" which means something that has not existed before. Yet again there is a difficulty here."Novelty" to a layman is different to that of an expert.I will define "an innovation" as something "novel" in the sense that *experts have agreed* did not exist before.

A difficulty for innovation is habit. The human species is very comfortable to work within boundaries and easily sets up habitual actions and routines. Once an innovation has been made ad accepted, it becomes a habit and makes it more difficult for the next innovator. What was regarded as a great innovation some time ago is now seen as commonplace.

Innovations abound in the visual arts. The human body has been painted for two thousand years in different, new, styles but always the eyes, nose and mouth were part of a face. Picasso was exploring how far he could distort the normal perception of a face and began what is termed "cubism" What is happening now is external. Picasso has agonised over the humanform he wished to paint and has created an image which he is satisfied with. The question now is how this image relates to the eyes of the observer. This is a second stage to the creative process – the creation of an external meaning from an internal meaning. It then resembles the Janus god who is usually portrayed as looking both ways.

The apotheosis of this process of creating meaning for the observer is the Mark Rothko Chapel in Texas. The main room is a hushed octagonal space with grey stucco walls, each filled by massive paintings. At first glance, the paintings appear to be made up of solid, dark colours. But look closely, and it becomes evident that the paintings are composed of many uneven washes of pigment that create variations in every inch. Stepping back, waves of subtle colour difference appear across the broad surfaces — leading to an unmistakable impression of physical depth. The observer then creates his own meaning. There is an atmosphere of reflection and a sacredness which reminds one of the cave paintings. The caves provided a protection for the paintings but maybe also the awe and wonder the atmosphere produced was instrumental in their choice

As our self-awareness has developed, our knowledge of the "non-human" world has also increased. We have found "human" characteristics in the "non-human" which themselves have properties that seem human – life, evolution, relationships. Thus, the distinction between the two categories: "human" and "non-human" is now becoming blurred. This reflects the work of Teilhard de Chardin and the Buddha. Teilhard made sense of the universe by assuming it had a vitalist evolutionary purpose. He interpreted complexity as the axis of evolution of matter into a geosphere, a biosphere, into consciousness (in man), and then to supreme consciousness. These new ideas of evolution give new meanings to our lives and afford new opportunities for creativity.

A currentexample of innovation and the fusion of science and art is the work of an experimental Canadian poet called Christian Bok and his project Xenotext which links language and DNA.[10] Bok has written two short poem**s** (which he called Ulysses and Eurydice) and linked them through a coding system. He has enciphered this code with amino acids and constructed a DNA structure which he has inserted into a microbe called D-radiodurans (this microbe was chosen as it is virtually immutable). The microbe then produces RNA which forms a protein which when deciphered can be read to produce Eurydice. The experiment has been successful but, the resulting protein is transient and soon dissolves. More research is needed to produce the required stability but in principle the idea works. The next step would be to produce more proteins and see if meaningful poems are produced i.e. human idea from non-human things. This can be compared with but is different to poems produced by artificial intelligence as these are intelligent algorithms where this process is linked to life itself.

Often, people's main concept of creativity is seen as making "a paradigm change" Paradigms are agreed perceptions. Because of the social nature of humans, these paradigms can become "reality" and are very powerful. It takes creative powers to see beyond these paradigms and to challenge them. Examples abound.

- Brunelleschi was faced with putting the largest dome ever made on the Cathedral in Florence. The left hemisphere thought it impossible and the mathematics needed was not available but through inner conviction, intuition and sheer brilliance he succeeded. It is still amongst the largest unsupported domes in existence today
- The second law of thermodynamics states that entropy is increasing and eventually the universe will end up as a featureless void. The opposite view is that the universe is a living, evolving process that is unending. But, surely the second law of thermodynamics is THE unchangeable fixed universal law – without it heat would flow from cold to hot and all sorts of funny processes would happen. But this is a belief. There is much scientific evidence to support it but scientific theories can be shown to be inadequate. One way out is to invoke local and non-local, closed and open systems where the law applies to one and not to the other. In Science, the tools used by Einstein -(curved space (Reimann), the transformations (Lorentz), relative motion (Galileo) – were not his. Einstein's creative genius was challenging the Kantian paradigm that space and time were a priori, independent

entities and the Newtonian theory of gravity to create the notion of space -time.

- In Music, even the ideas of tonality and harmony are now being challenged. The most influential composer of the 21st century, Phillip Glass describes his work as *"What I was looking for was a way of combining harmonic progression with the rhythmic structure I had been developing, to produce a new overall structure*.

4. Synthesis

Some of the issues that have most personal resonance are:

- As knowledge is increasing, we understand less;
- The infinite "infinity of varieties" can never be comprehended;Spirit is not leading the dance but the dance governing the spirit.
- It is possible that there is a future without us.
- Life forms are composed of non-life which is now revealed to be living!

These all impact on the notion of creativity in both Science and Art which are Janus type activities involving inward and outward challenges.

Conclusion. Recently, a new type of object, a "hyper object", has been created which isboth outside and inside of us Examples are economic forces, the unconscious, evolution, the biosphere, global warming and even pandemics.Creativity must attune to this new reality. Beauty is an atonement between two beings, a subject and an object, in which the subject discovers something surprising: it is capable of having an experience outside of its ego shell.

In my opinion, there seems to be a drift of control away from the "thinker" to the thing that is thought. The objects are beginning to speak. We are entering an Asymmetrical age. The artist is becoming all dressed up with nowhere to go. Creative ideas are beautiful souls packaged in the supermarket of anxiety.

The creative act is a wondrous act. It must involve a search, a resolution, novelty, awe, wonder and beauty. It is present in every minute of our existence. It is the definition of humanity.This article is a personal interpretation of the meaning of "creativity". All the views expressed are my own and I would welcome any correspondence concerning any of the issues raised.

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ТВОРЧІСТЬ: ОСОБИСТА ДУМКА

Сенс творчості – поняття ілюзорне й дуже суб'єктивне. Основну увагу зосереджено на чотирьох позиціях (цікавості, ілюзії, виконанні та новаторстві), які об'єднуються в єдину й цілісну "картину", що відображає особисту думку автора. Новаторська гіпотеза полягає в тому, що творчість пов'язана з роботою двох півкуль мозку, і це підтверджується посиланням на поточні нейробіологічні дослідження. Автор за професією математик, але у статті він стверджує, що на мікрорівні немає різниці між Мистецтвом і Наукою щодо акту творчості. У статті цей процес аналізується в контексті цікавості, ілюзії, виконання та новаторства. Можливість здійснити остаточний синтез надається читачеві.

Ключові слова: дві півкулі мозку, конструктивістські теорія мозку, креативність, ілюзія, інновації.

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ТВОРЧЕСТВО: ЛИЧНОЕ МНЕНИЕ

Смысл творчества – понятие призрачное и весьма субъективное. Основное внимание уделяется четырем позициям (любопытству, иллюзии, исполнению и новаторству), которые объединяются в единое "полотно", отражающее личное мнение автора. Новаторская гипотеза состоит в том, что творчество связано с работой двух полушарий мозга, и это подтверждается ссылкой на текущие нейробиологические исследования. Автор по профессии математик, но в статье он утверждает, что на микроуровне нет разницы между Искусством и Наукой в отношении акта творчества. В статье этот процесс анализируется в контексте любопытства, иллюзии, исполнения и новаторства. Возможность осуществить окончательный синтез предоставляется читателю.

Ключевые слова: два полушария мозга, конструктивистская теория мозга, креативность, иллюзия, инновации.