The logic-mathematics structures and the convergence of cognitive capacities towards the source of this information: the infinity.

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1. Introduction

Marino recently (2011) affirmed an important fact: "*I argue that cetacean and primate intelligence is a case of cognitive convergence. Convergence involves the appearance of a similar feature in two or more distantly related species whose common ancestor lacked the feature. The greater the phylogenetic separation of the two species, the stronger is the case for convergence, or, in other words, the deeper is the convergence.*"

Seed, Emery and Clayton (2009) indicate that in the last few decades, there has been a growing interest in the evolution of cognitive capacities, and there is increasing evidence that these capacities have evolved independently in several groups of vertebrae other than primates, such as dolphins, hyenas, canids, corvids, and parrots.

In a review on the cognitive evolution of avian species, Emery (2006) discussed the relations between the cognitive abilities of birds and mammals, and noted some interesting facts: i) the last common ancestor of corvids, parrots and apes, lived approximately 300 million years (Myr) ago; ii) the most recently evolved genera of corvids (Corvus, Pyrrhocorax) and apes (Pan) appeared at around the same evolutionary period: 5-10 (Myr) ago, showing a convergence; iii) this period had great environmental and climatic variability and instability; and iv) some ecological variables may have played an important role in the evolution of cognition in the great apes, therefore it is logical to propose a similar role for the evolution of cognition in corvids (and probably parrots).

The ecological variables considered by Emery are social structure, life history, habitat, diet, and innovation. Thus, is important to consider the evolution of cetaceans (dolphins, whales and porpoises), because their environmental reality is very different from that of apes and birds.

According to Marino (2004) over the past 50-50 Myr, cetacean brains have become hyper-expanded, such that the modern cetacean cephalization levels are second only to those of modern humans. During evolution, the cetacean brain went through two critical phases, in which its size greatly increased. The first increase occurred with the origin of the odontocetes of the ancestral group Archaeceti, nearly 19 Myr ago, and was accompanied by a decrease in body size. This increase was related to the emergence of the first cetaceans to possess the echolocation sensory and communication system used by modern dolphins and other odontocetes. The second major change was with the origin of the superfamily Delphinoidea about 15 Myr ago.

Marino also observed that the neocortical organization of cetaceans, based on extreme repetition of a relatively conserved pattern, is a radical departure from the brains of other large mammals, and is intriguing in light of their convergent cognitive abilities with primates.

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Montgomery et. al. (Montgomery et. al. 2013) recently clarified the difference in brain evolution of primates and cetaceans. First, primates show a strong directional trend towards an increase in relative brain size over time, whereas cetaceans do not. Second, whereas in the cetacean brain, body allometry is predominantly altered during three key periods, primate brain and body mass evolved under contrasting selective regimes across longer time periods, resulting in a continuous allometric change and the expansion of relative brain size. A difference of cetacean terrestrial mammals is that the computational power of their brains appears to have increased by adding new, non-repetitive modules, thereby increasing in structural complexity.

Hochmer et. al. (2006) studied the octopus, an invertebrate that exhibits great capacity for adaptation and associative learning, including visual and tactile discrimination and spatial learning. Thus, the study of convergence is specially exciting when phylogenetically remote animals, such as the octopus and primates, exhibit similar forms of complex behavior that may help reveal the basic principles of complex biological systems and ascertain whether their evolution may be due to physical constrains or functional requirements.

Similarly, in an interesting study on homology and convergence in vertebrates and invertebrates nervous systems, Sanderman (1999) raised the question of whether the same principle is used by animal brains to abstract, code and store their internal constructs of the outside world. The author believes that an appreciation of homologies and convergences in the nervous systems may shed light on this possibility and, more importantly, help to identify the principles themselves.

It must be considered that cognitive convergence involves processes that involve the interchange of information between organism and its environment. These processes include, for example, sensory and perceptual processing, learning mechanism, memory, behavioral flexibility.

All these facts lead to two decisive questions: i) why do seemingly disparate ecological variables in completely different environments come together to influence similar cognitive behavior in such distantly related groups; ii) why the different organization of neural structures produced during evolution by the interaction between organisms and their environments exhibit similar cognitive abilities.

In this paper, the above mentioned issues considered in the light of an earlier hypothesis (Yunes 2005) are discussed, to explain how is possible that the disparate ecological world variables can come together to influence the evolution of convergent cognition, and how different neural structures can evolve with convergent cognitive capacities

2. This hypothesis

This hypothesis is guided by a new method of analysis called “ontological reductionism”, seeking to overcome the drawbacks of the traditional reductionism approach, which views a system as a sum of its parts, generally atoms and molecules. However, this approach does not determine the ultimate reality of the parts, or their relationship with the system formed. The precise objective of “ontological reductionism” is to determine the ultimate reality of the parts of a system and also their correspondence with the nature of the whole system. Thus, this method integrates two opposite tendencies: the reductionist and the holistic.

This method requires a logic and mathematics that are interconnected. The logic must be an intrinsic logic that, as Lucas (Lucas 2001) indicates, can accept extrinsic and systemic logic as special cases. Intrinsic logic needs to be an interactional, connectionist form of logic. In complex systems, the idea of “uniqueness” is dependent on our history. It comprises a number of dimensions and displacements, but the “now” is defined by how these all interact, in a network. The number of extrinsic pathways possible through the network grows exponentially with size and connectivity. Lucas writes: “A true measure of such intrinsic value would therefore approach infinity (especially in humans), as desired by intuitive axiological approaches to the value of a human life”.

Mathematics, where we must observe as Franklin (Franklin 2014) affirms “that its truths are absolutely necessary, and that the human mind can establish those necessities and understand why they must be so. It is very difficult explain how a physical brain could do that”. Another important concept, also following to Franklin is that “It is impossible to escape the conclusion that pure mathematics reveals to us the topography of a region whose truths pre-existed our investigations an even our language”

Other guide of this hypothesis is the great importance of knowing the driving forces behind the evolution of some emergent quality, in this case, the cognitive abilities, because there must exist a relationship, or coherence, between the nature of the driving forces and the cognitive abilities. In reality, what is needed, in this case, is the coherence among the conception of matter, that of life and that of cognitive abilities.

Finally this hypothesis sees information, which has generally been neglected, as being of predominant importance in life and its evolution.

In 1990 the eminent physicist J.A.Wheeler (Wheeler 1990) was the first scientist to suggest that the physical reality itself may be a manifestation of information processing through his aphorism “it from bit”.

This hypothesis is receiving increasing acceptation among physicists due to experimental data and technological possibilities (quantum computation, teletransportation, cryptography). It is worth mentioning the work of Zeilinger et. al. (Arndt et. al. 1999) who demonstrated the existence of Broglie wave interference of the C60 molecule by diffraction in a material absorption grating. This molecule is the most massive and complex object in which wave behavior has been observed. The C60 molecule is almost a classical body, because of its many excited internal degrees of freedom and their possible coupling to the environment. The wave function contains all the information about the system. Zeilinger told Die Weiwoche magazine (Zeilinger 2006) “For me the concept of information is at the basis of everything we call nature” and “Quantum theory, correctly interpreted, is information theory”

Very recently Van Raamsdonk (Oulett 2015) based in new mathematics discoveries, as that curved space-times emerge quite naturally from entanglement in tensor networks via holography, affirm “Space-time is a geometrical representation of this quantum information”. Information creates the space-time reality.

These physicists believe that the most fundamental building block of the universe is not atoms or even quarks, but rather, information itself. But it is clear that information cannot be the material from which all perceivable physical aspects of our universe arise. We also know that light has a wave-like aspect and a particle-like aspect. Thus, light, and all the elementary particles, are neither waves nor particles. They are all both wave and particle. These two elements are constitutive parts of the reality, they cannot be separated, and neither can they be reduced to just one of them.

W. R. Loewenstein (Loewenstein 1999) who is renowned worldwide for his discoveries in cell communication and biological information transfer, considers the predominant importance of information, affirming that with one information flow, 10 to 20 billion years ago, the universe started with a bang and "Information welling from an uncomprehend source and transferred by forces unfolding from an ever increasing space, engenders organization: the elementary particles and the hydrogen and helium nuclei during the first three minutes, their atoms some 700.000 years later….Eventually, the formerly always straight information flow makes loops which, by the power of their feedback, whip it to more lively pace. Higher-tiered molecular systems are then engendered. With time, the flow gets more and more convoluted and the systems engendered, more and more complex. After some 4 billion years, they stand up and wonder about it all"

All fundamental particles can be described by the quantum field theory. Electrons and positrons that are considered the fundamental particles of matter, are associated with quantum fields, in the same way as photons are associated with the electromagnetic field. The particles of a given type indicate the state of excitation of the field. The particles are quanta of excitation of the fields.

The field occupies space, contains energy, creates a condition in space but is difficult to define exactly its real nature. This concept is relevant in biology and in this work, considering that one idea of the unity of conscious given by Popper (Popper et al 1993) suggested that consciousness is some kind of force field in the brain that is capable of unifying all the information carried by billions of neurons.

Assuming that information is in the basis of quantum reality, several arguments, obtained from experimental data given previously (Yunes 2005) lead to an important basis of this hypothesis: logic-mathematics structures are one predominant type of information that is present in the physical world, as a constitutive part of the "nature" that we know as reality, in the evolution olf life, and in the emergence of the mind in animals and humans.

Logic-mathematics structures are present in the biological world, because are present in their constitutive elements, process and mechanisms.

Taking the same line of reasoning Franklin (Franklin 2005) stated that "the objects of mathematics do not exist outside of space and time, but are immanent in space and time. Consequently, we hold that some simple mathematical ideas are indeed acquired in a causal manner".

In the past forty years, a number of new mathematical sciences, or sciences of complexity, have appeared, such as information theory, computer science, control theory, mathematics ecology etc. These sciences seem become a way of converting knowledge, or logic-mathematics thought about the real world, into a certainty, merely by thinking (Franklin 2005).

Today, the appropriate mathematics can help the biologists interpret any kind of data, and has enabled advances greater than microscope did, in terms of the biological reality (Cohen 2004).

3. Life and logic-mathematics relations.

But what is the importance of the logic-mathematics structures in the origin of life?
According to Lazcano (Lazcano 2008), as life is neither a miracle nor the outcome of a chance event, proper understanding of life requires the recognition of the evolutionary processes that led to it. The unity of life is involved in its origin.

Koshland Jr. (2002) indicates seven pillars of the temple of life; according to the essential principles of thermodynamics and kinetics by which living systems operate, the first pillar is: life is a "program". This affirmation is important for our hypothesis, as we shall see. In this concept, the program is thought of as a computational program that is based in logic-mathematics algorithms. However, it is not an essential definition of life that is, may be, unattainable and that would be possible if all the pillars can be assembled into a single, and universally valid concept.

It is evident that after the big bang, those same physical laws lead the matter to organize into different kind of galaxies and planetary systems. There is a tendency to the self-organization that in our world lead to the appearance of life (Davies 2006). According to the theory of self-organization, a sufficiently diverse mixture of molecules that accumulates in some place must, after some time, result in an autocatalytic system that leads to spatial patterns and then to life. (Kauffman 1995). Thus, Kauffman write "This theory of life's origins is rooted in an unrepentant holism, born not of mysticism, but of mathematical necessity".

Bacteria, one of the simplest life organisms, exhibits high complexity. Bacteria regulate the expression and activities of thousands of different genes and proteins to control metabolism, growth and differentiation. It is known that transcription factors interact with DNA to regulate gene expression, and bacterial signal transduction is shifting from a focus on individual genes and proteins in vitro to the study of whole system in vivo. Each component is now regarded as a node, which is connected to other nodes. In E. coli a model that is commonly used in these studies, there is a network with about 10^8 nodes composed of the products of about 10^3 different genes (Baker and Stock 2007).

Mycoplasma pneumonia, a small, single cell bacterium is the smallest prokaryotes that does not depend on a host's cellular machinery to reproduce, was studied to characterize a minimal cell. In different works, it was shown that transcriptional control and protein organization are more subtle and intricate than previously considered, and in many ways, appear similar to mechanisms in eukaryotes (Ochman and Raghavan 2009).

One fundamental difference between living and non-living matter is the existence, in the first, of the genome and the genetic code. There is nothing in the non-living world that is remotely similar. For this reason Yockey (1992), one of the notable pioneers of the importance of information theory in molecular biology, write a very interesting commentary "It is astonishing that the technology of information theory and coding theory has been in place in biology for at least 3.850 billion years".

However, considering our hypothesis of the immanent presence of logic-mathematics structures in the reality, this fact is not so astonishing. Thus, many scientists (Hornos and Hornos 1993, Bashford et al. 1998, Frappat et. al. 1998, Sciarrino 2003, Dragovich and Dragovich 2007) seek to demonstrate that the development of the genetic code is a manifestation of some mathematical principle.

The minimal cell as all organisms should be a whole integrated by different parts creating a unity. The whole and the parts have no meaning without their relation. A whole that is a dynamic complex system with a program that control all the reactions and also the time in which the reactions may occur, is a very complex program that must have, in its origin, like all process of self-organization, an important attractor and also different attractors for the parts. Thus, is possible to explain the mathematical necessity indicated by Kauffman.

Life is a very special fact that emerged guided by an important attractor that we analysis below (see Ward P.D., Brownlee D. 2000) .

4. How disparate ecological world variables can influence convergent cognition

Biological evolution shows a notable adaptation of living beings to their environment, to their world reality. The adaptation of living beings to their environment is caused by the interchange of matter, energy and in the case of cognition, fundamentally for "information".

Studying the simplest of all organism: bacteria, Ben Jacob et. al. (2006) report an important fact: some modes of behavior might reflect underlying (primitive) elements of biotic cognition, and this shows that an organism without nerves displays remarkable behaviors. Bacteria are not the solitary, simple organisms they are considered to be. Certain bacterial species self-organize into complex colonies of 10^{10} members. Bacteria use several methods of biochemical communication, and colonies can change their space-temporal organization to adapt to changes in the environment.

The authors suggest that besides "negative entropy", organisms extract latent information embedded in the complexity of their environment. Latent information refers to the non-arbitrary space-temporal patterns of regularities and variations that characterize the environmental dynamics. The primitive elements of cognition (the roots) in bacteria include the interpretation of and the response to chemical messages, the differentiation between internal and external information, and some self vs. non-self-distinctions. Learning information to reduce the uncertainty and update a notion of the reality of the environment is a driving force at this level (Yunes 2005).

One fundamental aspect of biological systems is that they can use internally relevant information to self-design their own engineered organization. We do not still know completely how bacteria solve the fundamental requirement for life.

Bacteria have genes which allow the communication between them and process information about their environment, making decisions and synthesizing agents for defensive and offensive purposes. Thus, A. Tero et. al. (Tero et. al. 2007) consider that Physarum is able to solve a maze and to connect multiple food locations via a smart network, and for this reason, they study how Physarum amoebae "computes" these solutions. As was mentioned, the genes are guided by a "program" to develop strategies, for example, against the different antibiotics.

It should be considered that cells are also cognitive entities. The cellular biochemistry is subject to computational regulation because the molecular interactions involve multiple inputs that need to be evaluated algorithmically, to generate the appropriate cellular outcome (Shapiro 2006).

In this aspect Helikar et. al (Helikar et. al. 2008) have assembled a discrete Boolean model of signal transduction comprising 130 nodes, and examined how different combinations of external inputs translate into cellular responses. The model reproduced known input-output relationships, and also evidence of the possible emergence of information-processing functions from the complex cellular network of molecular interactions. The model reflects the ability of the cell to integrate complex environmental signals, and translate them into robust specific responses and behaviors.

Is important to note that the application of complex engineering approaches, i.e. logic-mathematics approaches, to cell signaling networks, must lead to a novel understanding and, subsequently, new treatments for complex disorders (Abdi et al 2008).

Following the tree of the evolution, it is observed that learning information to reduce the uncertainty and thereby update the rudiments of their notion of the "reality" of the environment, and of its own body, were predominant factors in the development of the nervous system (Yunes 2005). The emergence of the nervous systems is regarded by Jablonka and Lamb (2006) as a major transition in evolution because it "not only changed the way that information was transmitted between cells and profoundly altered the nature of the individuals in which it was present, but also led to a new type of heredity-social and cultural heredity, based on the transmission of behaviorally acquired information".

The indicated predominance of information is particularly noted in the development of the sensory organs that permit living beings to receive very important data related to the environment and transmitted by light, sound, chemicals etc. for their survival.

Examples of convergence are found in the sensory organs of vertebrate and invertebrates where structures exist that are believed to have arisen independently from the interaction between living beings and the common physical world.

It is known that light and the light/dark cycle, was probably one of the most important selective or driving forces to act on biological organisms. A notable consequence has been the evolution of eyes.

The most commonly referenced example of convergence is the eyes of squids and fish. They arise from different embryological sources, indicating different origins. However, Gehring and Ikeo (1999) have shown that same ocular development in different phyla can be coordinated by a homologous master gene Pax 6. This fact leads to their proposal that eyes are monophyletic, i.e. evolved only once. There is an interesting controversy about the convergence of these important sensory organs to enable the development of important cognitive capacities.

However, there are important reasons why the monophyletic hypothesis cannot be accepted: i) it has been suggested that eyes evolved 40 times independently based on, among other facts, the distinct ontogenesis origins of eyes in different species (Nilson 1996);ii) the Pax 6 gene organizes other structures besides the eyes, and is even necessary for the onset of various actions outside the nervous system; iii) other studies have shown that Pax 6 does not act alone, and that building an eye requires suites of interacting genes. According to Ben-Jacob the genome is a sophisticated cybernetics entity that includes, metaphorically, a user, a computational unit, and a hardware engineer (Ben-Jacob 1998). This genome is the internal guide of evolution, just as the environment is its external guide.

Besides the eyes, others sensory organs also gather essential information from the environment. Dolphins obtain information by echolocation (Au 1990); and electro-receptive fishes use the ability to detect and analyze naturally occurring weak electrical fields generated by various animals and inanimate sources (Bastian 1990). But all these different organs obtain the same basic immanent information from the environment such as size, form, location, shape, number and danger that is logic information, of objects or living organisms; this is logic-mathematics information.

In one hand, it is possible to describe the physical world accuracy by structures, such as numbers, geometric figures, vectors. Equations and causal inference describes the world with accuracy. On the other hand, accurate perception of the spatial location, size, shapes, and danger of predators, causal relations and material composition of objects is vital for animals to interact with the physical world.

This kind of information explains the convergence of the cognitive capacities. Is the reality of the environment the cause of the convergence, because it can be as deterministic as we once believed only genes could be (Francis and Kaufer 2011). The logic-mathematics structures, that are immanent to all reality of the environment are the only universal reasonable guide of sensory organs and cognition.

It is necessary to indicate that other important factors participate together with these structures as colors, smells, different sounds etc. of the environment and emotions, social feelings, etc. of the living organisms.

Among animals, is important to note recent experiments about mathematics abilities on species as diverse as fish and monkeys. Fish can to "count" up to at least three, and can distinguish between larger and smaller quantities (nine vs. six, six vs. four), as was demonstrated with tropical angelfish (Gomez-Laplaza L.M. Gerlai R. (2011) Can angelfish count? Discrimination between different shoal sizes follow Weber's law; (Animal Cognition 14, 1-9). Rhesus monkeys can count up to four in ascending and descending numerical order, monkeys trained on an ascending numerical rule spontaneously infer the ordinal values of novel numerosities when the numerosity varied from 5 to 9. Brannon and Terrace (Brannon and Terrance 2000) affirm that the number is a meaningful dimension for rhesus monkeys.

It has been demonstrated that other animals as pigeons, parrot, rats, dolphins, ferrets chimpanzees etc. can also count. Thus, mathematical ability appears to be fundamental for survival of these living being.

This interpretation has the support of the function of the visual system. Modern studies indicate that the visual systems work as a geometry engine that determines image structures by measuring partial derivatives simultaneously at each point and at many resolutions (Wells 1977).The brains of humans and perhaps all animals work by "organization laws" of perception (Gestalt Psychology) that consist essentially of the constitution of geometric spatial-temporal structures or kinematics (Piaget 1967). Thus, the information is sent from the environment by photon patterns (geometry) and these patterns are grouped and kept as a whole by the brain, like algorithms in networks.

Spelke et.al. (Spelke E., Lee S. A., Izard V., (2011) has observed that the human intuition about the properties of points, lines and figures according developmental psychology, cognitive anthropology, animal cognition and cognitive neuroscience is based on at least two distinct, ancient evolutionary core cognitive systems for representing the shapes of large-scale and small scale movable forms and objects. Thus: "Euclidean geometry may be constructed through a productive combination of representations from these core systems, through the use of uniquely human symbolic systems".

Spelke (Spelke 2011) also indicate that “A basic understanding of number and geometry is fundamental to almost all the activities of modern humans, from trade and economics to measurements and technology, to science and the arts”.

It is fundamentally important to note that according to DeLoache (DeLoache 2004) a symbol always represents something “other than itself”. For this reason, younger children are inclined to focus on the concrete object itself, rather than what it represents. The objet and what is represents should be at the same time as when we say” I know that I know”, and that requires a loop without time, it requires the human mind to have the capacity for self-reflection (see Yunes 2013).

It has been observed that the ability to estimate quantities, and reason those estimates arithmetically, exist in the brain of the animals that do not use language, and probably explains why the same, or a very similar mechanism appear to operate in parallel with verbal estimation and reasoning in adult humans. They operate to some extent before children learn to speak and before they have had any tutoring in the elements of arithmetic. These findings suggest that the verbal expression of number and of arithmetic thinking, is based on a non-verbal system that is used to estimate and comprehend discrete continuous quantity, which we share with many non-verbal animals (Gallistei et. al. 2005). Gallistei et. al considering these facts, suggest that the neural substrates for this system arose “ back in the evolution of brains precisely because of the puzzle that Wigner has called attention to: arithmetic reasoning captures deeply important properties of the world, which the animal brain must represent in order to act”.

5. How different neural structures can evolve with convergent cognitive capacities.

A notable fact is that despite having completely different nervous systems and environments, behavioral experiments demonstrate that octopuses and rats can distinguish objects based on size and shape. They also can learn to get out of simple mazes.

Invertebrates show a notable difference in their body plain, nervous organization and cognitive capacity. Between the Cephalopods, the octopus shows the greater cognitive capacities. Zullo and Hochner (Zullo L., Hochner B. 2011) suggest that the body structure is the key to the emergence of its neural organization and cognitive capacities. I shall follow their comparison between octopus and the vertebrates.

One important principle of organization of the vertebrate is the topographic sensory and motor representation of different body parts (somatotopic organization). However, it has recently been shown that this somatotopy applies only to the major body parts and a gross scale. The representation seems to be of the “function of a body part” rather than that of the body part itself.

The octopus has a relatively small central brain (CNS), which integrates the information sent by the visual and tactile systems i.e. the optic lobes and the peripheral nervous system (PNS) of the eight arms. The octopus appears not to use the somatotopic representation of movements of body parts in higher levels of the CNS. The octopus shows an organization of overlapping circuits, each possibly representing a motor function.

The evolution of Cephalopods (octopus) leads to several morphological modifications that have contributed to their success. The cephalopod nervous system is integrated by the CNS and the PNS. The large PNS includes the nervous system of the body and the arms. The CNS consists of the brain and the two optic lobes. Thus, the organization of the nervous system of cephalopod is different from the other mollusk, other invertebrates and vertebrates.

Zullo and Hochner conclude that "the absence of somatotopic representation in the octopus may have evolved together with its unique body plan". Interestingly, they also affirm that "Therefore, a somatotopical organization is not required in the higher motor center. Instead, the distributed and overlapping sets of motor areas in the higher center may represent motor programs which may be integrated with multimodal sensory information".

Paul Patton (Patton 2008) notes the marked difference between the neocortex of mammals and the dorsal ventricular ridge of birds. The former is a sheet of tissue, with nerve cells organized into layers and with different parts of the sheet performing different functions. The latter is a mass of neural tissue with a series of clusters of nerve cells specialized for various functions. However, they share similar connections to other parts of the brain. Despite the important differences in the neural systems they exhibit similar cognitive functions.

Güntürkün (Güntürkün 2012), In his review on the convergence of the evolution of brain and cognition, showed how mammals and birds can organize their behavior flexibly over time, and how they have evolved with very different structures but similar skills. Thus he affirms: "Birds and mammals have independently evolved the highest cognitive skills. Within the class of mammals it is the primate order that stands out in cognitive terms. Within the class of birds, corvid's and parrots take a similar position….. Despite these similarities in cognitive terms, birds and mammals have vastly different organized forebrain".

Sensorimotor neuroscience can be conceptualized by different mathematical approaches. These approaches may be from different perspectives and levels of analysis.

We have mentioned a simple cell is a whole that is a dynamic complex system with a "program" that controls all the reactions, and the time in which these reactions may occur. From this point of view the neural networks of the octopus and that of vertebrates were self-organized during their evolution following different logic-mathematics algorithms that satisfy the same functions. In the case of octopus, these logic-mathematics algorithms constitute a motor "program" that, as Zullo and Hochner have indicated, may be integrated with multimodal sensory information.

It is important to note that according this theory the logic-mathematics structures not only underpin the living physical reality, but also the relationships between their constitutive parts.

Having analyzed some important facts that show similar cognitive abilities gained by different species of animals during their evolution, in relation with disparate ecological variables in completely different environments, it can be observed that logic-mathematics (shape, size, perception of spatial location, causal relations specially of predators etc.) is the unifying factor that explains the similarities that exist.

It is also observed that different forms of computation of the organism give rise to different neural structures, but with similar functions. This means that different programs used for different neural networks and physical structures can result in the same cognitive abilities because as this theory suggest, the logic-mathematics underpinning the physics reality and the connections between their constitutive parts.

The notable difference of brain structures between cetacean and primates, mentioned above, despite their similar cognitive capacities gave rise to two interpretations: one of Manger (Manger 2006) that attributes to the thermogenesis, and other of Marino et. al. (Marino et.al 2007) that considers that depends largely to response to similar social demands. However, in the light of this hypothesis it is suggested that depend predominantly of the great difference of the logic-mathematics structures that exist in the terrestrial ecological environment respect to the existent in the oceans. The social demands are important but not predominant.

But, what is the origin of this logic-mathematics information? How can we explain the convergence of the cognitive capacities towards a point or towards the source of this information? It was mentioned that Loewenstein consider information to be originated from an uncomprehend source, and this fact should be analyzed.

6. Logic-mathematics information origin and conclusion

Vannini and Di Corpo (see more details :Vannini and Di Corpo 2011)) explain that in 1927, Klein and Gordon reformulated their equation of 1925, as a combination of Schrödinger's wave equation (quantum mechanics) and the energy/momentum/mass of the special relativity. Thus, the equation depends on a square root and yield two solutions: the positive solution describes waves that diverge from causes located in the past, governed by the law of entropy (retarded waves). The negative solution describes waves that convergie towards causes located in the future and governed by the law of syntropy (advanced waves), this is the "negative entropy" of Schrodinger, later called negentropy.. The negative solution introduces in science teleological tendencies and final causes. Final causes, attractors, which absorb converging waves, are observed.

The discussion about teleology, which some reductionist consider unacceptable, is considered by Toepfer (Toepfer 2012), that indicate: "The underlying reason for the central methodological role of teleology in biology is not its potential to offer particular forms of (evolutionary) explanations for the presence of parts, but rather an ontological one: organisms and other basic biological entities do not exist as physical bodies do, as amounts of matter with a definite form. Rather, they are dynamic systems in stable equilibrium; despite changes of their matter and form (in metabolism and metamorphosis) they maintain their identity. What remains constant in these kinds of systems is their 'organization', i.e. the causal pattern of interdependence of parts with certain effects of each part being relevant for the working of the system". Thus, the identity of biological systems cannot be specified without teleological reasoning.

Entropy is a measure of loss of information, which itself is negative entropy. Information comes from a source that is in the past and in the future, outside of time, and its increase has a consequence: the reduction of entropy. In syntropic phenomena (Vannini A. 2005) entropy diminishes and thereby inverts the second law of thermodynamics.

The evolution of the increasing cognitive capacities, in disparate ecological world variables and with different neural structures, converges towards the attractor which emits the converging advances waves, and in same way, specifies a property of this important attractor. It is attractor and a source of information. A simple analogy would be sunlight, a source of energy and an attractor of plants.

It is important to note that as the retarded diverging waves orient time towards the infinite, the advanced converging waves, increasing the information, lead the cognitive capacities, by logic-mathematics necessity, toward an infinite attractor, whose non-physical nature is in a higher level in relation to the process governed by the second law of thermodynamics.

This fact is consistent with the above considerations that explains how disparate ecological world variables can influence convergent cognition, and how different neural structures can evolve with convergent capacities and the interpretation of Walker and Davies (Walker and Davies 2012), that the key distinction between the origin of life and other "emergent" transitions is the beginning of distributed information control, "enabling context-dependent causation, where an abstract and non-physical systemic entity (algorithmic information) effectively becomes a causal agent capable of manipulating its material substrate".

This non-physical systemic entity corresponds to a higher level; it is a top-down control of the information in the parts and in the whole. In a sense, it is holographic. It is a program, software that control and command life, and it is algorithmic, but who introduced this program to the physical and chemical reality? Here, we need the help of a superior entity that, in origin of life, could only have been the source of the information. During the evolution of the human mind I (Yunes, 2013) suggested that the mind will make contact with this attractor, which should be, by logic deduction, the infinite source of information, the presence of infinity. Therefore, following the principle that only a life being can give life, we can assume that the infinite source of information, besides its maximum knowledge of logic-mathematics, is also a living being.

In antiquity, the notion of infinity was subsumed in the word apeiron (see an interesting suggestion in Kvasz 2004). However, apeiron has a broader meaning, applying not only to what is infinite, but also include the concepts of no boundary, indefinite or blurred. For medieval theologians, the road to infinite is the same as the road to God. God is an infinite being. God is absolutely positive and unequivocal. All ambiguity is a consequence of human finitude and imperfection. This fact opens the infinity itself to become an ideal subject of mathematics investigation.

Nicholas of Cusa shows that infinity (God) could be accessed by symbolic representation and asymptotic mathematics. Cantor realized this endeavor showing that the Absolute infinite is a symbol for the unlimited God. This is the bridge between mathematics and theology.

The ontological root of this idea was not present in ancient Greece: the God of Xenophanes as suggested by Gandpierre and Kafatos (Grandpierre and Kafatos 2013). But it was present in the God of Galileo Galilei who wrote: "mathematics is the language with which God has written the universe" (Galileo 2005).

Mathematics is likely to be important in any effort to understand God in a scientific way. The degree to which God has any perfection is absolutely infinite, and mathematics is used to precisely define absolute infinity (Steinhart 2009). However, this concept can be taken literally only when infinity in general is shrouded in mystery." The comparison of the mathematical with the theological concept brings into light the experience of God as the mysterious unspeakable " (Jill Le Blanc 1993).

Applying the mathematics Reflection Principle, which states that every property enjoyed by the Absolute is also enjoyed by a lesser entity, I suggested that the Absolute by a mechanism of induction, confers on the human mind some properties that He enjoyed: "Image and Similarity".

Thus, the human mind is led to a higher level of hierarchy, enabling it to comprehend the information that underlies the reality. In light of these conclusions, this hypothesis is a new approach that reunites science and religion.

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