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Reexamine the Evolution from a perspective of Life Informatics

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Abstract *: The life information evolution is a theory which runs parallel with the Darwin's theory of biological material evolution, including chemical evolution, biological evolution, and information evolution in the human evolution. The Darwinism is the theory basically about the living matter evolution. We believe that the life essence is not only the material, but also the information. The theory of life information evolution is a promoted version of the theory of biology evolution in the information age. The goal of this paper is to suggest that the theory of biological evolution should be related to the entire universal life information evolution mechanism, which is helpful for us to reveal the rule of life information evolution.*

Keywords：life informatics; evolutionism; intelligence evolution; intelligent spectrum in the universe

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1. Summary of life informatics

The explicit concept about life informatics is firstly raised in a topic "Establish Life Information sciences, Greets 'the Information age' of Life sciences". This article discussed the concept of life informatics, the research way and the methods, some basic theories and significance of the related research work. It regards the life information study as a new stage of the integration of the information science and technology, medicine and biology, life science. Life Informatics is the integration of information science and the whole life science and its purposes is to

study common information problems of all life phenomenon using the concept, principles and methods of information science. If the traditional biological research is mainly on the "living" material, life informatics studies on "living" information system, its basic idea is to regard the life activity as the life information adjustment and control process.

1.1. Object and field of the study

Its object includes not only the biological macromolecule and the cytology in the discussion mainly in biology, but also the individual psychology and social thought in sociology; and human, plant, bacterium, virus information, and even the artificial information.

Life information science is the discipline which study on ration information exchange between living organism and environment, it mostly covered: ①Quality information life science: study on quality information exchange between living organism and environment, achieve the purpose on intervening living body life processes in the way of quality information exchange; ②Energy information life science: study on energy information exchange between living organism and environment, achieve aim at intervening living body quality system and its life processes[1].

1.2. Characters of life information

Mainly about: ① Distinguished from the general physics information, life information fit the living information exchange well and appears as low energy information carrier which could play an important role on physiology and pathology of living body; ②Life information has a certain physical property, definite frequency range and strict numerical order; ③The character that the living organism is taken as carrier must be considered when life information affect on it.

1.3. The theory of life information evolution

Since Darwin proposed the theory of evolution, the creationism has gradually vanished from the stage of history. Darwin's theory neither profit from science and technology in modern physics, nor benefit form modern information science and technology. The means of research is mainly to observe, compare, analyze, Record, the objective are merely involve the organ of plants and animals, organisms and their living environment, it is just the life of hardware and variability of genetic phenomena. Life information is the leadership and the record to life evolution. The theory of life information evolution proved the progress of information procedure one by one in the great transition along the history of life evolution from the beginning of life evolution which the start of inorganic information process. It went through the formation of human culture, the development of information science and technology, and then to the Internet as a "neural network" Global Brain and the No-sphere[2].

It can be from the history of the vertical point of view and can also be from a realistic point of view horizontally to study the

[1] Gu Han-sen. Wu Du-min. (1988).The Summary of Life Informatics. Nature, 11(5),339-349.

[2] Li Zong-rong. Zhou Jian-zhong. Wang Cheng. (2003). Some Important Discoveries about the Study on Life Information. *Medical Information,16 (10),*538-539.

phenomenon of life information. At the vertical layers it is linked to an evolutionary chain, while in the horizontal layers there is one group on its closely evolution lap. The unidimensional history adds on the three dimensional reality synthesizes the four dimensional space-time which can be described as "four-dimensional model of the universe of information." The information of universe is not conserved, but increasing. At human socio-cultural and technological level, life information is growing explosively. If it is assumed that the amount of life information is zero at the time of Big Bang, then grows out of nothing, from few to many, the space would like a funnel shape. Or with the time passed, it is like an ever-growing ice cream, we could call it as "ice cream model" of life information[3].

2. The mechanism of life information evolution

Throughout the evolution of life, the evolution of information is fundamental and is the soul, because the evolution of life information is the leading and the record of life material evolution. The growth which goes through the level of minerals close to zero to the highest level of human's brain and stretching to the artificial intelligence of machines belongs to intelligent growth crossing the species. In a particular species, a biological individual must continue to "learn" and adapt to environmental changes, then the ability of living increased with times. What is the mechanism of evolution of life information?

2.1. The Level of Evolution of Physics, Chemical, Biology and Society

The outstanding contribution of Darwin is to provide a lot of facts and a more reasonable mechanism of the evolution of biology and achieve victory in the struggle with creationism. In fact, biological evolution is just a stage in the whole universe evolution. Biological evolution has evolved a large and complex human society and scientific and cultural knowledge systems growing by exponent. In fact, the mechanism of evolution at the level of human society and culture is not promoted by natural and random factors. The movement of biology is not purely because of the natural forces, and it is nor a completely random process. Generally speaking, there are always the purpose of survival and survival strategies of nearing to advantages and avoiding from harms, and they can carry out "self-design". Their behavior is not only to respond the outside stimulus and to understand, study and change the environment with purpose and intention as well. If blind force works in the field of physics, it will perform acting elements' own intentions, identification, selection, role in the chemical level. Here, and it is not just the result of random external factors. In 1987, the French chemist Jean-Marie Lehn, one of winners of the Nobel prize in chemistry, borrowed "identify" concept from biology, and clearly put forward "chemical information" needed by "Molecular Recognition" was stored in the chemical structure in which elements are interacted. In chemical reactions, and molecules search the best state according to chemical information by itself and other molecules, and hence force determine composition and structure of mechanism and product of the chemical reaction. He further pointed out that chemical reactions changed from the original random pattern

[3] Li Zong-rong. (2001).Questions about the Basic Research on the Information Science. *Science & Technology Review, 2001(4),*3-6.

into the smart model in the conception of "molecular". Therefore, "We can identify molecular recognition as the process of processing and selecting chemical information"[4] .

2.2. Information Evolution

The traditional theory of evolution and the systematology is set up on the basis of material, while the information-centric concept of information science can not be set up on the basis of these. But this does not mean that we have to oppose the traditional theory of evolution. In fact, all species had contained information evolution within its system from the beginning to the end of the evolutionary process, but Darwin's time people do not understand this point, as a result, the traditional theory of evolution missed the part of information[5].

The specific mechanisms of information evolution (Biological evolution is also in this law) has two aspects: First, assimilation, that is, copying, dissemination, leaving future generations, it makes the continuity of information. Second, alienation, that is, diversification, which allows information to develop and value-added in order to disseminate more effectively[6]. An important mechanism which resulted in diversification is the introduction of outside information, diversification brings the information group more chance of winning in the competition of the dissemination right. Sexual reproduction of living beings, cross-disciplinary and foreign things serve China, all reflect the laws[7].

2.3. The Theory of Life Material Evolution and the Theory of Life Information Evolution

The essence of life is more information than material. In a sense, Darwin's theory of evolution is basically on the material lives of the theory of evolution. There is a theory of life information evolution parallel to the theory of evolution of characteristics and species. Life information evolution is the dominant and records of material evolution. The evolution from minerals which own intelligence close to zero level to the highest intelligent level of human brain, to extend "artificial intelligence" of the machinery, belongs to the intelligent growth of species. Inside a particular species, a biological individual must continue to "learn" and adapt to environmental changes, and its "thinking" ability increased with times. People's heart is the engine of the material life, and the brain is the motor of life information. The self-organizing capacity of human society and the state including the level of the means and tools, grows apparently with continuity. The conclusion is the same for DNA and cells, and is slightly different for the behavior of intelligent.

In human society, products can not be completed unless material, Production must regard energy consumption and raw materials as prerequisites. However, the production of information requires very few materials and physical and chemical substances, and it does not consume information materials nor information energy. On the contrary, intelligence is a growing energy. The knowledge of production without consumption and the continued proliferation of intelligence is the internal mechanism of explosive growth of information products.

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2.4. From the Material Life Science to Information Life Science

The completion of the human genome project marks information life sciences at molecular-level has been effective. With the pace of the 21st century, material life science is moving into information life sciences. From the relationship between knowledge and practice, the decision of substance is the perception problem which is to understand the world, and the decision of information is practice problem which is to transform the world. The relationship between material life and information life is like the computer hardware and software systems. Achieve "information transformation" of the material life science will directly affect our "view of life, which is the view of aim, the value and significance of human existence".

The structure and metabolism of material life is a represent form of information vitality. We may have become vegetative persons without information activities at the symbolic level and we may have become dead persons without information activities at the DNA level. The whole biological world is not the device of conversion between material and energy, each of the individual produces and creates information and intelligence at different levels. Before the middle of the 20th century, natural science was largely about the material science and social science was about information science. The emergence of communications and computing and control sciences led the disciplines to science of information and were linking up the natural science and humanity and social science. Tool's informationization is effective, and the role of concept's informationization is being shown. Life science' informationization needs of a "message of life" concept. We need to recognize and admit: there are two lives for one person, material life and information life.

2.5. Generalization of the Concept of "Intelligence"

"Intelligence" is the unique ability for people to understand and transform the world, described in "Modern Chinese Dictionary", meaning that animals and other biology can not own intelligence, not least of machines. In the dictionary in the United States and Britain, the interpretation for the intelligence is not confined to "human" ability, but first of all, it is broadly explained as learning and understanding from experience and the ability to access and preserve knowledge, then it also includes the mental ability of human. Scientific objective is to reveal the law of the objective.

In the computer science word, especially in the artificial intelligence, people generally believe that: the so-called human intelligence is just a ability of senior perception and process of information for human; Senior capacity dated from the lower level of ability, and if there is no lower intelligence of animals as the basis, there will never human intelligence in fantasy. If we deny the theory of evolution, we will have to accept the doctrine of God creating man. Intelligence of the human brain has not only processing of biological signal, but also has processing of symbols owned only by people. However, computers and robots can also have the ability to process biological signals and symbols. "man-machine war." in May 1997's, the world chess champion Garry Kasparov lost to the computer called "Dark Blue" with the scores 2.5/3.5. Professor Tong Tian-xiang said:" The machine defeats world champion, on its effect, is equal to the people's smart behavior[8]. Like the other

[8] Tong Tian-xiang. (1997). From "man-machine war" to "man-machine Symbiosis". *Studies in Dialectics of Nature, 1997(9).*

computer programs, “Dark Blue” just faithfully implements its manufacturer’s instructions. We believe that the artificial intelligence will be the most important technical means to promote the evolution of human intelligence in information society.

2.6. Generalization of the Concept of "Intelligence"

Apart from the human chauvinism bias, it is supposed that animals and plants have some sort of similar intelligence, bacteria, viruses, DNA all has "intelligence", but just inferior to the level of intelligence. The most basic ability of information movement of inorganics is the originating point of human’s advanced intelligence. If we assume the level of human intelligence as 1, the level of inorganics will be 0, the intelligence level of animals and plants is at between 0 and 1, which constitute a gradual increase band, called “intelligent spectrum”(Spectrum of Intelligence in the universe) [9].

The evolution of information in the universe can be seen from the transition from inorganic information, biological information to cultural information, but can be inspected more from the gradual upgrading information processing capability (intelligence) in the universe. The facts about the evolution of intelligence show as following: In the universe, there is a spectrum from low to high about intelligent evolution that is, "intelligent spectrum in the universe". This is almost the consensus of researchers at home and abroad. Chinese scholar Zhong Yi-xin said: "We can imagine a continuous space of intelligence, and arrange people, machines, animals, plants and so on in this space in the appropriate place according to the relative levels of intelligence; All things have a certain level of intelligence, but their levels such as high and low are different; human has the highest level of intelligence while non-living things own a minimum of intelligence–having no intelligence and others ranged within.[10] "In our study on biological informatics, a four-dimensional model in the study of evolution of information in the universe is put forward, which considered intelligence spectrum in the universe as a basic fact and beginning point.

3. Discussion

If the essence of information evolution is the intelligence evolution, then, what is the mechanism of the evolution of intelligent? The energy of physics is with the material itself, and it performs in the exercise and work. Similarly, intelligence and information are also inseparable, and it exists in the process of information campaigns. The copy of information makes intelligent immortalize. If we see the measure of information carriers as an alternative of information metric, you can visually see the increase of information. The terminology used computer speakers, intelligence is the capacity of "procedures" coding by information language or symbols in the terms of computer. DNA sequence is the procedure coding by genetic signals, and in the human society, the various models, the way of thinking, the rules of operation are procedures coding by scientific and cultural symbols. The essence of procedure is algorithms, which reflect the main purpose, strategies, methods, techniques of information and so on. That these procedures can be copied, modified, is the mechanism of adaptation to the environment and advancing with the times. "Intelligence"

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[10] Zhong Xin-yi. (2002). *Principles of Information Science.* Beijing: Beijing University of Posts and Telecommunications Press.

is persistent and enhanced during the evolution of the version. This is the inner accordance of the evolution of life information. The inner driving force of intelligent evolution is artificial selection.

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