

Biological Study of Ethics for the Human who lives in the Information Society

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Abstract The organization of activities uses information. The activity is the substance of information. The organization of primitive creatures provides a guideline when we think about how to live in an information society. The life is a system of activities. The first creature was born together with an ecosystem. The fundamentals of present creature were formed before several hundred million years. The principles for a life have been taken over by cell division. Essentials of life for updated ethics are summarized by the concept of activity.

Keyword Origin of life, Self organization, Distributed autonomous system, Cell division, Ecology, Ethics of life

1. Introduction

Today, we can get information from all over the world by using information technologies such as internet. No matter how much information we get, the real world is different from information. The mind is individual. The problem of human relations as ethics increased in the information society rather.



Fig.1. Objectives of this article for the ethics: To clarify the origin of individualities of a mind and differences between a real world and the information.

Epistemology has been discussed for ethics from the era of ancient Greece, because the problem can be reduced through understanding. The author considered that recognition is able to explain from view point of biology.

That is, information is related to recognition by the reaction to supply for demand. Those have been evolved through the way of life that involves the ecosystem. The study of origin and evolution of life will contribute to clarify the basis of information society. Namely, this approach is a biological study of the ethics. It is different from the bioethics such as assisted reproductive technology, or genetically modified food

The activity of a creature depends on the state of itself and that of the outside. The information on the conditions is used for the reaction. So, the origin of information began together with origin of life. The communication i.e. exchange of information is necessary for the life in a community. The language is necessary as the foundation of the social life. So, the word is the existence that continues to walk with mankind.

The fundamental activity of creature is carried out by an individual as a unit. The information that is required differs by each individual. Such information is renewed with the progress in time. The communication has the effect to decrease the individual difference.

The important information is stored in medium of memory. The information that was recorded has been increasing. The information stored does not change. The information is used individually. So, the difference of individual recognition is increasing due to the information society.

The understanding that the human recognizes himself as a creature has effects to solve the problem. The understanding that the foundation of life is the same will increase the tolerance.

The transmission of information on an activity in a cell is depending on the transmission of a substance. The unconscious mechanism of such reaction is inherited by reproduction on the occasion of cell division. The activity of a life plays the role unconsciously. The conscious reactions of human depend on the unconscious activities of a life. A role of information is not able to accomplish it with only information itself.

The information that was transformed to a medium remains. The memorized information increases according to the progress of time. The biological viewpoint is able to transfer us to the outside of human society. It helps to solve the problem on the world of information.

The concept of activity is useful concept to clarify the mechanism on the life. Origin of life and even activities of human today are described by this concept. This article about the organization of activities was written so as to become a reference when we think the ethic in

information society.

2. The environment where the first life was born

2.1. The purpose that studies the origin of life

Today's modern society possesses complicated activities, and it is difficult to summarize the essential activities of human. Today's creature possesses complicated mechanism, and it is difficult to summarize the essential activities of life. Then, the origin of life and mechanism of primitive life are investigated.

The creature existed by repeating the activity that reproduces it as shown in Figure 2. It is enabling the life activity in the future, because it continues the activity of recycle.

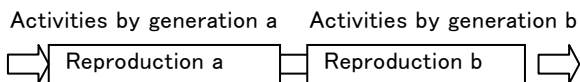


Fig.2. A creature exists through a self-reproduction, and the activities of future are guaranteed by the reproduction.

The creature differs with a physical substance. The reaction of a creature depends on the circumstances. The circumstances are changed by the reaction. The creature continues the activity that yields continuing change as shown in Figure 3.

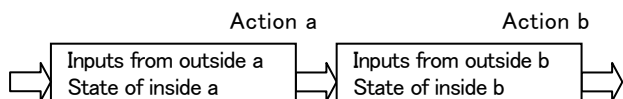


Fig.3. A creature changes reaction according to the situation and a situation is changed by the activity. So every thing is on the move.

2.2. Environment where a first life was born

[Hypothesis on the formation of a soup for first life birth]

The first life that continues activity was not able to be born, if various substances did not exist in the environment. The author proposed the mechanism of which organic substances were produced plentifully in the early earth [1]. Basic facts for this hypothesis are as follows.

Table 1. Volume percentage of CO₂ in atmosphere of terrestrial planets [2] p.87

Earth	0.037%	Venus	96%	Mars	95%
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Table 2. Solubility of gas [cc] to 1cc of H₂O [2] p. 503

CO ₂	1.71	N ₂	0.024	O ₂	0.049
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It is considered that the atmosphere of early Earth was composed with carbon dioxide (CO₂) like Mars and Venus. The data are shown in Table 1. Here, CO₂ is easy to dissolve into water (H₂O) as shown in Table 2. CO₂ in the atmosphere of early Earth dissolved in sea water in the early Earth. Also, the iron (Fe) that existed in the earth's crust dissolved in the sea plentifully. Then, the oxygen was removed from carbonated water with the oxidization of Fe. This way, organic matters were produced in the early earth.

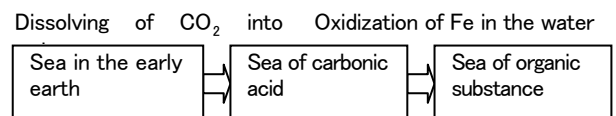


Fig 4. Environments of early earth where the first life was born

[Experimental evidences] When we add iron (powder or shape of wool) to carbonated water not only iron oxide but also floating materials are produced [3]. According to X-ray analyses, the floating materials are carbide of iron. The iron carbide reacts with water, and the reaction produces not only iron oxide but also organic materials (compounds of carbon and water).

[Chemical interpretation] The values of electronegativity (by L. Pauling) are listed in Table.3. Here the value on carbon (C) is larger than that on hydrogen (H). Then, iron atom connects with the oxygen of CO₂ in the carbonated water.

Table 3. Electronegativity for deoxidization

C	2.5	H	2.1
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Table 4. Ionization tendency for combination with C

Fe	>	H
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The carbon atom that was deoxidized by Fe bonds to Fe, because the ionization tendency of Fe is larger than that of H as indicated in Table 4.

Fe and C become iron carbide. As for iron carbide Fe₃C, a carbon atom connects 3 pieces of Fe atoms. cf. a carbon atom connects 3 pieces of O atoms in a carbonic acid (CO₃). The iron carbide is the intermediate substance. That is characterized as metallic bond and covalent bond and ionic bond. Fe₃C has a tendency to decompose in water [3]. The hydrolysis of Fe₃C produces iron oxide and organic materials. Cf. acetylene (H-C≡C-H) is produced by hydrolysis of CaC₂ (namely carbide).

2.3. Synthesis and dissolution of organic molecules

Random chemical reactions produced many kinds of carbon-containing molecules before a life began to live.

The organic molecules are synthesized by dehydration and those become a polymer. The polymer that was synthesized is able to decompose by a hydrolysis. The similar phenomenon breaks out by exchanging of oxygen. That is, it is synthesized with a deoxidization and that disassembles it with an oxidization as shown in Fig. 5.

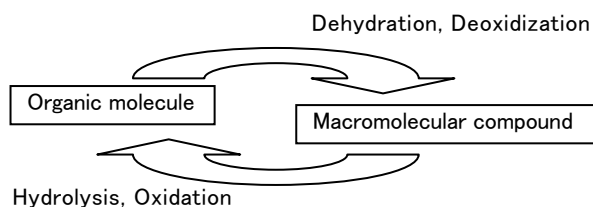


Fig. 5 Synthesis and dissolution of organic matter

2.4. Formation of cell structure by a membrane

The molecules will arrange voluntarily on the water, if those consist of hydrophilic heads and hydrophobic tails. If such molecules are linked together on an interface of water, those are able to form a membrane as shown in Fig.6. The membrane exists in stability, because it is reconstructed voluntarily by the process of construction.

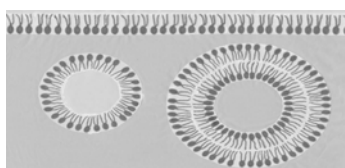


Fig. 6. Lipid molecules make a membrane on an interface of the water. In aqueous environments, those molecules form a micelle and a liposome of bilayer.

In water they will associate to form closed bilayer vesicles in which the hydrophobic tails are in contact with one another and the hydrophilic heads are exposed to the water as shown in Fig.6. The vesicle makes possibility to organize activities. That is, it is a membrane of cell or a frame of liposome.

2.5. A proton (H^+) that supplies energy of activity

A proton (H^+) is an excited state of hydrogen and it possesses energy. H^+ is easy to move because it does not have an electron only with a nucleus. A lot of H^+ is included in the water that lost oxygen atoms by iron oxide. If there are many H^+ in the outside liquid of the membrane, H^+ enters into the membrane. And H^+ connects with molecules of the membrane. So, the density of H^+ decreases gradually towards inside of a membrane and the potential of inside become lower than the outside of the membrane. This potential difference works so that

H^+ is entered towards inside of the membrane naturally. When H^+ density of outside of vesicle is high, the vesicle is able to receive the hydrogen with energy.

2.6. Control of activity by transmission of materials

A reaction is controlled by the condition for the reaction. If a particular molecule is the condition that starts a reaction, the molecule is able to control the reaction selectively.

If a result of former reaction is the cause of next reaction, the next reaction starts after the former reaction. This is the mechanism of a chain reaction.

There is the chain reaction that takes necessary substance from outside and discharges the unnecessary substance from it. Such chain reaction continues, if it circulates.

A circulating series of reactions can be organized by a movement of wave where the driving force for the circulation is given by the wave at first. Here, the energy of activity can be stored into a cell, if the circulation takes necessary substance from outside and discharges the unnecessary substance from it.

If the reaction that circulates with the stored energy is driven, the chain reaction that circulates comes to continue to circulate independently. Such activities are not able to materialize by a single molecule.

3. The organization of activities for a creature

3.1. Organization of activities for reproduction

The circulating chain of reactions is able to add a new function. Here, a substance is able to move along with the flow of H^+ , because H^+ has an electric charge and mass. The molecule that is included to the substance that passes through the membrane may react with the membrane. That is, there is the possibility that adds a new function to the membrane.

If the cell adds a processing of reproduction as an additional function, the products are produced by the flow repeatedly. Even the organization that has complicated structure can increase the number easily by the reproduction. A creature has come to exist with the activity principle of reproduction.

3.2. The mechanism of evolution

Those activities of a life are organized with reactions and those are carried out step by step. A creature causes a reaction according to the updated condition. The activity is organized with the logic of reaction described by If-Then rule. The action changes the circumstances. The

ecosystem is changed by the activities. The creature that possessed advantageous functions to live survives. Then the evolution of creature takes place.

The mechanism of an evolution is similar to that of an invention. That is, the function that supplies to the demand is improved by trial and error in a real world. The mechanism of change in the industrial society is similar.

The progress of developments is large, if there is much demand and there are a lot of possibilities. The principle is the same. But, if the performance develops drastically, the devices will change drastically. In such fields, there are many kinds of disappearance. There are difficulties in the work that estimates the experiences in the past that disappeared.

3.3. The structure that operates a function for a first life

The central dogma that makes a protein from DNA (Deoxyribonucleic acid) via RNA (Ribonucleic acid) is shown in Fig. 7. This dogma describes a flow of the information in the cell that makes a protein.

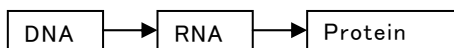


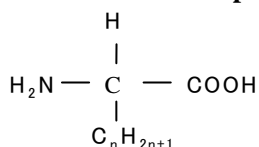
Fig.7. Reproduction of protein by the central dogma

When a conformation of protein is changed, the protein molecule returns to the original conformation by adding consumed materials after for a while. A protein molecule becomes the catalyst of the reaction of an organic molecule. Such protein is possible to reproduce. Those functions come to carry out the activities of a life.

Here, the cell that carries out the operation is necessary to make a protein. The protein is made as a thread, but it functions in the form of 3-dimensional structure. The mechanism of central dogma must be formed by primitive lives in the era of chemistry evolution. That is, the life teaches demands and supply and the functional target for the protein. The author considered that the protein was produced by the support of life as follows.

At first, the structure that contributes to live was made in a cell membrane. In the condition where the function is operating, the protein that possesses overlapping function has come to be made. It has been evolved by accumulation of experiences. Such a protein has come to carry out various functions of activities for a life.

3.4. Structure of a protein molecule



An amino acid has the structure that attached an alkyl group ($\text{C}_n\text{H}_{2n+1}$), H, NH_2 , and COOH to C as shown in Figure 8.

Fig. 8. An amino acid

A protein is produced by the peptide linkage that is a dehydration bonding between neighboring amino acids. COOH of an amino acid that adjoins with NH_2 of the amino acid that there is a protein connects.

A protein is a thread that possesses the edges of a carboxyl base (COOH) and an amino base (NH_2). The edge of NH_2 is located at the outside edge of plasma membrane. The edge of COOH is located at the inside edge of the membrane.

The protein that is a chain of peptides becomes a 3-dimensional structure by the drainage-interactions among alkyl groups. According to a nature of the side chain, there is the amino acid that has an electric charge or the amino acid that has an electric dipole moment. Such an area in a protein plays a role of hydrophobic function or hydrophilic function. An organization of a chain reaction is realized by such function of the protein molecule where H^+ is moved toward one direction.

3.5. Formation of molecule organs in a cell

The organ in a cell was formed by molecular evolution during the period of unicellular organism. Invaginated patch of plasma membrane is available for a specialized function. An internalization of specialized invaginated membrane forms a vesicle [5].

On the other hand, the segmentation of one fertilized egg forms organs in it. The embryology makes clear the process that forms organs in a multicellular organism. There are similarities in the forming process on organ between a unicellular organism and a multicellular organism. So, it is considered that the mechanism to organize a function by molecules is the base to organize a system of organs.

4. The information system in a life body

4.1. The organization that reacts instinctively

A circulating of activities can be continued by such mechanism that stored energy is used at the time when the driving force of the outside is lacked.

A creature circulates a chain of biochemical reactions. The following is an example of life cycle.

A plant sprouts from a seed. A bud grows to flower. A seed is produced from the flower. Each activity in the life cycle is considered as a preparation for the future.

Although it is considered that the activity of animal is instinctive, such activity is the unconsciousness activity for a life. An instinctive activity depends on heredity.

There are many activities due to heredity. Such plural of activities can not perceive in our mind. The origin of subjective activity of human is the unconscious activity of a life.

4.2. The cell division that needs signaling molecules

As a cell becomes big the cell membrane receives a strong stress. The membrane of the place that receives a stress must reinforce.

When a cell is reinforced by the membrane which separates into 2 pieces, another cell is made under the limited conditions. At the cell division, it is necessary that each cell possesses every function in order to survive. Organs needed for a life must be dispersed into the cytoplasm where signaling molecules and the devices for decoding are necessary.

The protein is produced by the liposome that is allocated inside of the cell in an actual cell. The signaling molecules are produced where there is the demand. The command is received by the cell membrane and the liposome.

4.3. The photoreceptor that is controlled by light

It is necessary for a life to collect information from the outside. A sensing is carried out by a reaction. A dynamic reaction is a sense of touch. A chemical reaction is a sense of smell. The reaction for voice is auditory sense. The reaction to light is the origin of a vision.

The sensitivity of such sensing organ is adapted by plural reactions as follows.

As an example, there are ligand-activated ion channels and voltage-activated sodium ion (Na^+) channels for a photoreceptor as shown in Fig.9 [6].

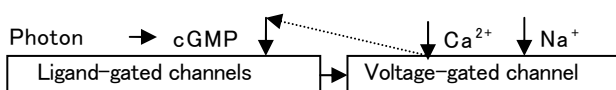


Fig.9. Reactions of channel in a photoreceptor cell

The ligand-activated ion channels of photoreceptors (rod and cone) in a retina are opened by the ligand of cGMP (cyclic Guanosine Mono-Phosphate). The frequency of spike caused by voltage-activated Na^+ channel relies on the potential difference of membrane.

Decrease in internal concentration of cGMP is triggered by light via rhodopsin. So increase of cGMP is triggered when it is dark. The cell is depolarized in the dark, because Na ions flow into the cell via cGMP. Then, the membrane potential of photoreceptor becomes high in the dark. Opening of voltage-activated sodium channels emphasizes this depolarization. An adjustment of

sensitivity for the voltage-activated sodium channels is carried out by shifting of the membrane potential by cGMP-activated ion channels.

On the other hand, the production of cGMP is restrained by calcium ion (Ca^{+2}) that mixes to Na^+ via voltage-activated Na^+ channels. When it is bright, decrease in internal concentration of cGMP via rhodopsin closes Na^+ channel, and the cell is hyperpolarized. But, the reaction due to Ca^{+2} transfers the membrane potential toward middle level, and it has effects of the adaptation to brightness i.e. light adaptation.

4.4. Vision and unconscious activities for vision

There are two types of receptive fields in a retina. Each field is placed alternately. In an ON center-receptive-field, a spot of light produce the big response if it fills the center. The center and the surrounding are antagonistic. OFF center field has a converse organization. ON and OFF field cancel each other's contribution.

Here, the output from the nerve cells those integrate moves together with a movement of light. By using such signal, the eye movement can be controlled in order to fix to the picture that moves.

There is the fovea in center of a retina. The density of cone is very high in the fovea. But, there is not rod in fovea. The image that is projected in the fovea is analyzed. The signal that comes from rod provides information on view field without view point.

Moreover, the binocular activities are used for depth perception.

As shown in Fig. 10, the vision consists of not only a conscious activity but also such plural unconscious activities.

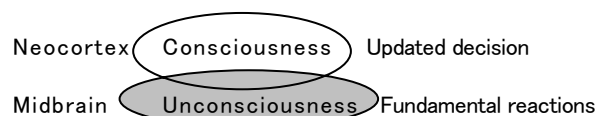


Fig.10. Vision and unconscious activities for vision

There are circuits for unconscious movements of eye in midbrain. The recognition is achieved by using systematically stored images in nerve circuits. The vision consists of such activities.

Birds and mammals achieve advanced recognition by using systematically stored images in neocortex. But, amphibian such as a frog possesses only archi-cortex in its cerebral hemisphere. It does not possess neo-cortex. But a frog bites insects by using visual sense.

5. Systematization of information

5.1. The origin of signaling system for a life

The first substance used as a signal is a molecule. The receptor that connects it with the signaling molecule has to relate as a lock and the key. The activity of receptor is played repeatedly by a molecule as the key. There is the origin of information in a system of replay.

Fig. 11 shows the relationship between a real thing and the information.

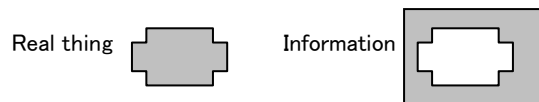


Fig.11. A real thing and the memory as an information

The creature has come to use an enzyme protein and the ground substance for the signaling. The enzyme corresponds to a signal and the ground substance corresponds to a receptor. The enzyme protein i.e. signal is able to ignite the reaction that is specified by the ground substance. Then, a part of information on the reaction has come to be memorized in the structure where the enzyme protein is produced.

5.2. The compatible systems for evolution of life

In the evolution of a creature, a new development is added under the operation of established system. There is a period when the operation of a new system overlaps with old system. The structure that does not operate disappears by and by.

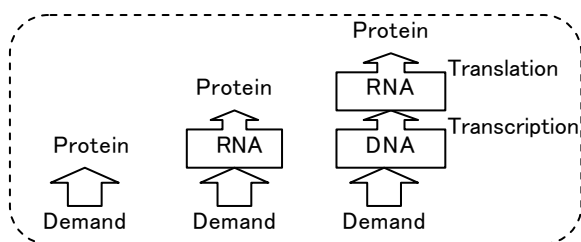


Fig.12. Evolution of the equipment by which a protein is made

Fig.12 illustrates the evolution of equipments by which a protein is made. The equipments to manufacture a protein must be complicated like a protein. The next stage of equipments for the same protein includes RNA. The equipment of RNA is easy to make. The last stage of equipments for the same protein includes RNA and DNA. The equipment of DNA is easy to make RNA.

By the way, a newborn animal stands and walks soon. An insect metamorphoses and grow. As for such reaction that is acquired without learning, the information must be inherited by genes. The structural genes and functional

genes must function at good timing to do those activities. But, how the base arrangement of DNA is working is not yet clear.

5.3. The time-sharing structure of information

Information with many components is distinguished by the layered operations. That is, the combination of the decoded results of first stage is decoded by time-sharing operations. The signal processing with layered structure of information improves reliability and operating efficiency.

An illustration on the processing for a layered structure of information is shown in Fig.13.

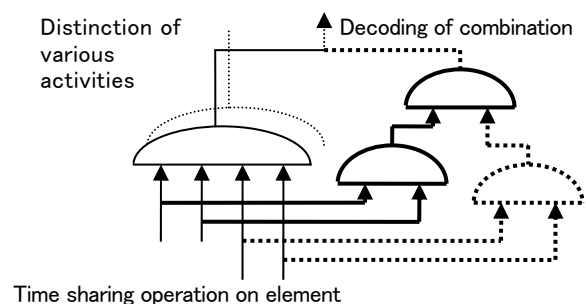


Fig.13. A system for improvement of reliability and operating efficiency by layered structure of information

Most of creatures express gene information with time sharing layer structure. A codon is a unit of genetic code in protein synthesis where amino acids are specified by 3 pieces of 4 kinds of bases (i.e. A, G, C, U) [8]. A unit of information corresponds to one of amino acids with 20 kinds.

The equipments for this system include messenger-RNA, transfer-RNA and ribosomal-RNA. The messenger RNA informs arrangement of the amino acid that expressed it with codon. The transfer RNA carries an amino acid to ribosomal-RNA. The ribosomal-RNA produces a protein according to the information of m-RNA.

5.4. Circuits of neuron in a brain for language use

The signal in a brain is an impulsive positive voltage. It takes out electron from molecule and it excites the state, and it causes a reaction. The signal informs the timing on operation to destination. The meaning depends on the effect of the destination. So, even if an impulse is analyzed, the meaning of destination is not provided.

That is, the meaning depends on the speaker and listener. If we use a word mutually as the same meaning, we can exchange the information though the word.

The Circuits for communication are formed in a

neocortex in a human cerebrum and those provide the function of memory through usage of words.

The layer structure of the language expression where a combination of words makes a sentence is the structure shown in Fig.13.

Each activated portion in thalamus suppresses the other. The interaction results in the functions of “a winner takes all”. The activity that is selected by thalamus circulates temporarily in the neocortex. The circulating activities form a reaction where each neuron functions as a filter at each junction. The reliability of understanding by overlapped activities on the layer structure is higher.

6. Conclusions

In this paper, a biological ethics was described by the concept of activity. The matter that is related to information of a creature was explained as follows.

The substance of information is considered as activity. Information is transferred by a chain of reactions, because an activity in a chain reaction is transferred. The effect of information depends on the human of an individual. Although it is difficult to study about problem of an individual, it is possible about an individual as a creature.

The author found followings by focusing on data processing of creature. Layer structure of the time-sharing of gene code (codon) is the same as the structure of language. The process that forms organs in a unicellular organism by organic molecules resembles the process that forms organs of a multicellular organism through cell divisions.

A newly added part cooperates with the system that has been established. After that, the overlapped portion in the established system will be replaced by the newly added system. The area overlapped of old system disappeared and became the missing link. Those are left as the subject to be research.

The author hopes that this report contributes to clarify the life and the information society.

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