Self-Formation
What is life?

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That which we call "Life" is the unifying force that organizes materials at a higher level; it is the ability to create order and the force driving self-formation. This monograph seeks to consider how this self-formative force of life works within biological activity and evolution, and contemplates the issues of inevitability, contingency and freedom within the flow of life. It is a an attempt at a natural philosophy that aims at transitioning from the mechanistic worldview that reigned from the 19th thru 20th century to a vitalistic worldview that perceives Mother Nature as a 'living nature' in possession of unlimited productivity.

1. Mechanism and Teleology

The Limits of Molecular Biology

In the conventional molecular biology, it was considered that DNAs within nuclei were as the blueprints of life, and that all the information on the structure and functions of the life form was embedded within these DNAs, and that life forms were created under the commands of these DNAs.

As widely known, DNA molecule is characterized with its double helix structure, in which four bases are connected according to a definite rule of bonding between the two chains. It contains information about the structures and functions of the life form. On DNA replication, the two chains of the double helix come apart, and as parts of each chain (known as nucleotide) respectively gain their complementary nucleotide, two new and identical DNAs are created. Thus, the perfect replication of the DNA molecule is accomplished, allowing cells to divide in the same form.

In the chemical compounding process of protein, first, a messenger RNA copies a DNA molecule, then bonds with a ribosome. Then a transfer RNA specifies one amino acid out of twenty different types, and communicates it to the ribosome within a cell. Ribosomes are capable of combining twenty types of amino acid to compound various types of protein, hence enabling a cell to form. Similar process is repeated when forming a life form that consists of numerous cells. Thus, DNA

molecules are believed to have various types of information necessary for forming proteins and cells, embedded within themselves.

However, such molecular-biological analysis on structure is not sufficient to elucidate everything about life phenomenon. Nor is it sufficient enough to solve the mystery of the essence of life itself. Of course, molecular biology has been successful in decoding the genetic information contained within DNAs and elucidating physicochemically and in detail the system of how various types of proteins are created by them. However, the more the structure is elucidated, it seems that we get more confused on why life forms are equipped with such system, or what is driving many molecules to work in such complex and delicate manners. That is because molecular biology does not even attempt to provide any explanation to these issues. And yet, unless we explicate these 'why' and 'what', we have to say that we will never understand the essence of life, that is, 'what is life.'

The contemporary molecular biology is, in all aspects, limited to providing knowledge about the material, structure and system of forming life itself, just as biochemistry used to be. Even if all the mysteries about the material, structure and system were solved, it still does not mean the same for the mystery of life itself. It is just as elucidating in detail how Venus de Milo is made of marble and how the marble stone was carved would not solve the mystery of where the beauty of the statue came from. It strongly suggests the limitation of physicochemical and mechanistic methodologies the contemporary biology –including molecular biology falls into.

Molecular biology has indeed elucidated the minute systems of life forms in micro scale utilizing its physic-chemical/mechanistic methodologies. However, it is yet to be explained why life forms move in such way, or how these movements are accumulated so that a life form would keep one specific form. Molecular biology has failed to provide any explanation for the basic plan and the basic objective of a life form.

It is inarguable that the contemporary molecular biology has succeeded in providing certain degree of explanation to the relationship between genes and cell differentiation. All cells that form a body of multicellular organism, originate from a single cell – a fertilized egg – that repeats somatic cell division numerous times. Therefore, all somatic cells are supposed to carry the same chromosome constitution and identical gene arrangement. However, notwithstanding, in the cell differentiation that accompanies the growth of multicellular organism, each cell takes different shapes and tasks, and express different characteristics. In order to explain this, molecular biology suggests that the genetic information responsible for the expression of characteristics is regulated within each cell. It suggests that within DNAs, other than genes that create various types of protein (known as structural

gene), there exist other genes, including operator gene that controls their actions, promoter gene that accelerates the action, and also repressor gene that regulate the action by cancelling those genes effects, and that when these genes work properly in each steps of cell differentiation, it results in different types of morphosis.

However, even if that was the case, still no explanation is provided as to why and by what each gene is made to work in such ingenious ways. In the process of a fertilized egg's cell division, some parts become eyes, while others become digestive organs or limbs. Just the molecular arrangements of DNAs do not seem sufficient to explain the solution of the mystery of this growth. Although it may explain how the growth takes place, it won't be capable of explaining what is causing such function.

In fact, molecular biology has a dogma, which ordains that, "there is no sender for messages included in the information of DNAs." That is to say, molecular biology has abandoned in the first place to even think about what is causing the functions of DNAs. However, unless we elucidate what is causing this life activity, we can never say we have elucidated the life itself. Moreover, if molecular biology has given up on stepping into this mystery, it also suggests that the physicochemical/mechanist analytical methods – on which molecular biology stands – have fundamental limits to their ability to elucidate the question of 'what life is.'

Molecular biology is not necessarily a science about the substance known as DNA, but rather a science about the information that is embedded within DNAs. However, information itself is not a substance. Therefore, its existence itself symbolizes the limitation of physicochemical/mechanist methodologies. The information structure contained within DNAs is completely separate from a simple substance, and it carries a certain purpose. In fact, molecular biology's basic concept of 'DNA's command' already includes a certain level of concept of purpose, which premises something beyond mechanism. However, molecular biology does not provide any narrative to this issue.

Another dogma of molecular biology, that is, "DNA is the blueprint of a life form," also is nothing more than a dogma. We cannot assert that DNAs are solely responsible for all the decisions regarding the subtle life phenomenon within cells, equipped with a complex system of control. We cannot necessarily explain it with simple mechanist causality, by saying, for example, "DNA is the cause, and all life phenomenon are its result."

As a matter of fact, another dogma for molecular biology, that is, "Except for the cases such as mutation, genes are permanent," has also fallen apart. For example, immunoglobulin G, the chief element for immune antibodies within serums has an ability to create a large quantity of antibody by

actively modifying genes on its own. The Y-shaped immunoglobulin G has approximately 300 types of genes that determine the structure of its tips, and is believed to be capable of creating approximately 20 million different types of antibody by itself. Moreover, in doing so, immunoglobulin G reacts against and identifies the foreign antigen, and correspondingly modifies genes in order to create the proper antibody.

Also, it is assumed that humans, who have only 20 thousand gene pairs – approximately equal to that of sea urchins – must have acquired the complex system by utilizing one gene in various different ways. Judging from the cases in which different genes forming the same shape and the same genes forming different shapes, genes may not necessarily is the decisive factor for shapes. If anything, genes may only be mere tools for life form create their shapes. As seen in the example of the same gene creating the upper labium in lamprey eel and the nose in mammals and other vertebrates, the same gene may work differently in different places. This suggests that genes could be read differently in various ways, depending on the environmental change.

If that is the case, we must conclude that life phenomenon are not determined by DNAs in the beginning, but rather conducted through the continuous interaction with the external environment. DNA is an individual life form on its own, and it continuously reads in the external environment while concurrently adapting itself to it, conducting its life phenomenon within the interaction between the interior and exterior. In other words, this interaction is what life is, and life itself is not determined by the permanent molecule we call gene. Life is not as simple as molecular biology has concluded it to be, nor something that can be explained with atomism. Life, after all, still remains mysterious.

Purposiveness

Life form on Earth does not consist of all elements that exist on this planet. Among all elements, life form on earth consist mostly of carbon, and other few elements that are easily combined with carbon, and are suitable for functions such as circulation, excretion and metabolism and, are water-soluble. Such elements include oxygen, nitrogen, hydrogen and sulfur. This suggests that life form is not created as a result of totally voluntary and mechanical bonding of any elements on Earth, but is created with a certain purpose as a life form, and in the shape conforming to it. There is a sense of purposiveness, which may very well be responsible for selecting the few elements and systematizing them. It is obvious even in this example of the structure of life forms that they are not bonded in a simple mechanistic way.

Observing the components of life forms at the molecular level, we find that, when creating proteins and nucleic acid, even if we turned all substances existing in the universe into amino acid and bases, there won't be sufficient amount to mechanically cover all possible permutations of the sequences of bases and amino acid. Given that, when contemplating on the origin of life form also, it is impossible to think mechanistic that, amino acid and bases were created at random in the beginning, and then their interactive relation was created also at random, resulting in the creation of various proteins and nucleic acid.

Organisms are not just chunks of proteins mixed without order. Even simple organisms, such as prokaryote are structures orderly composed of various substances including water, proteins and nucleic acid. Furthermore, higher forms of life would have much more complicated structure and order. The question as to why life forms have such order can never be explained mechanistically, whether in molecular biology or in biochemistry.

Life form is an individual, purposive order. Of course, machines are also structures suited to a certain purpose. However, no matter how advanced the machine is, a high-spec computer for example, its purpose is given from outside and created by other force. Life form, on the other hand, can automatically create this purposive order within itself. It looks as if to have its roots in the formative force that has been dwelling within substances on Earth, from which life form was composed. This is the sole point, for which life form and machine can never be comparable to each other. Machines do not have serf-formative ability, whereas life forms, no matter how primitive they are, connote this ability.

Moreover, life forms do not just put all these elements and molecules in order purposively, but also take in and excrete substances and energy from/to the external environment in order to keep the order flexible. In short, life forms maintain themselves by metabolizing substances and energy, keeping the mutual communication between each part, and changing the components of their constituent elements to adapt to the external environment. This function of self-maintenance through continuously changing its interior under the interaction with the exterior is what is different from a simple machine. Life forms are not mechanical but rather a fluid order, and are capable of surviving extraneous disturbances, by continuously adjusting themselves and adapting to the changes. Life forms are not a passive order that only react to the extraneous stimulations, but rather an active order that actively corresponds to the external environment.

The same thing can be said even if we reduce the scope from 'parts of life forms' to 'DNA.' DNA attempts to survive by continuously changing its genes and adapting to changes in external

conditions. Modification of genes is one of these adaptations. Life forms are fluid order that maintain themselves by reading in the conditions of external environment and changing themselves in accordance.

Limitation of Mechanism

Conventional biology, including molecular biology and biochemistry, has considered life phenomenon as something caused by its material and analyzed it by parts, then came to think that the total sum of these parts is what life is. Then it tried to elucidate various life phenomena, such as growth, proliferation, metabolism, outbreaks, reproduction, heredity and evolution, from the aspects of structure and function of substances. Thus, contemporary biology perceives life forms as machines consist of molecules, and concluded that life phenomena are nothing but molecule reaction process, which utilizes biopolymers as its parts. However, such mechanistic way of thinking that tends to adhere to individual parts and think little of the whole picture has limitation, which derives from its negligence towards the totality of life forms. Mechanistic view of life is unable to elucidate the fact that life is a totally unified and fluid order.

Of course, mechanism does strive for structure analysis of life forms in an attempt to elucidate this order of life. However, while being thorough in doing so, mechanism will again crush into the problem beyond the mechanist view of life at the final step, ultimately failing again to come up with a final answer to the question of "what is life?" That is because mechanism always tries to capture the whole picture of the totally unified and fluid order we call life, by dividing into bits and reconstructing them.

Life is something that is constantly changing and at the same time maintaining the sameness of itself, and those two characteristics are fundamentally indivisible. If we attempted to divide it into some material parts, life will immediately become invisible. Therefore, we will never be able to capture the life itself by reconstructing those material parts and finding the total sum. Of course, the more we analyze the structure of life forms, the more chemical and physical facts will be found, and the accumulation of information from them will reach enormous amount. However, no matter how much of such physicochemical/mechanist methods we practice, the essence of life itself will never be grasped, much like a faraway rainbow.

Life forms are totality that each part interact with and control each other, organized and put in order. The life of these life forms, or the totality of them, can never be grasped by analytical and mechanist methods. Because, the totality can also be defined as the kind of unification with more of such characteristics – more than all individual parts that constitute the totality combined. Each part is not

just functioning on own, but functioning in relation to the interaction to other parts, as well as to the interaction with the totality, which is formed by those interactions. Therefore, when life forms are dynamic order with such delicate and complex structures, it is impossible to comprehend them through simply dividing them in parts and summing them up.

Mechanist method is valid only when material aspect is cut out from the totality that is the essence of life, but is too insufficient for understanding the totality. This is also the reason why mechanism can never elucidate the purposiveness that indwells within life forms. The same goes for the microscopic aspects of molecular biology and biochemistry that are not always able to explain the macroscopic aspects of the life world that are elucidated by ecology and morphology. Ecology attempts to answer the question of "what is life?" through focusing on interactions, between different life forms as well as between life forms and the environment, while morphology studies the purposiveness of the forms of organisms. The more progress biochemistry and molecular biology make and microscopic structures of life phenomena become elucidated, life that causes them would become the more mysterious, and be left behind.

Suppose there is a robot that is controlled by a computer. It is capable of perceiving the condition of outside world, and it infers, recognizes and judges based on the perceptual information and make a certain reaction to the outside world. Incidentally, we are able to go inside the robot in order to learn its structure. However, in this case, no matter how much we investigate the interior of the robot, all we can find would be various parts functioning together, and the contemplation function the robot practice will remain invisible. The contemplation the robot practices – its perception, inference, recognition and judgment – is not the material parts inside the robot, the circuits of the computer inside or electron current that runs through them. The contemplation of the robot consists of information integrated within the interaction of these material parts. However, the information itself is not materialistic/mechanical parts. Information is entirely different from these things.

The same thing can be said about life as well. Life itself can be defined as the information integrated on the relations between materialistic/mechanical parts of life forms. However, its information itself is never a physicochemical something. In order to constitute a life form, proteins and nucleic acid are essential substances as its material. However, just collecting these substances does not mean a life form can be created right away. In order for a life form to be created, from the simplest unit to the most complex organ, these organic substances must be organized organically under a certain implication system. Life should be perceived as a purposive implication/information system, organized by arrangements and actions of these substances. The contents implied on the materialistic relations between substances are different from the substance itself.

Mechanist Perspective on Nature

The modern Western natural science began with distinguishing between spirit and material, mind and body, and human and nature. It continued on to physic, chemistry, biology and even medical science, all of which analyzed material separated from spirit, and body separated from mind, as their objects, and attempted to find their laws. In these ways of science, human was the subject that recognizes nature.

Such dualistic worldview of the modern West has created the mechanistic perspective on nature, and thus, the idea that considers organisms that belong to nature as also a kind of machine was formed. It considered life forms as something similar to machines consist of various parts and gears, and that they, too, should obey the physicochemical laws. The reason why the contemporary biochemistry and molecular biology employ physicochemical reductionism is on the extension of this idea. They started to consider life phenomenon as a mere variation of physicochemical phenomena. Such physicochemical perspective on life considers life forms as machines. It considers a life form to be composed of individual parts, and thus tries to understand it by breaking them apart, and by element by element. By elucidating structures and functions of each part, it tries to understand life forms as machines. It is also based on the element-reductionist/mechanistic perspective on nature, which is the foundation of the modern natural science.

However, a life form is an organism in which the totality and parts are in interdependency. Certainly, the totality depends on parts. However, the totality is not equal to the total sum of all parts, and always shows characteristics that are unseen in any of its parts. Therefore, if the totality is destroyed, parts lose their meanings, and become no different from any other simple substance. That is because parts thoroughly depend on the totality. In a single life form, too, if the force that organizes it is lost, organs and cells that composed it will cease their functioning, and will be reduced to simple substances.

Even if we succeeded in elucidating the molecular structure of DNA, decoded all genetic information recorded within, and finished listing them up, it still would not mean that we elucidated the whole picture of life phenomenon. Life is the formative force that composes these substances, and the self-formative ability to write in orderly information. Because there is some kind of force that organizes all substances and gives them meanings, a life form can be a life form.

Life is not always created by simple accumulation of substances. Rather, there is a totality called life at start, which is then divided into parts each function is allotted to, eventually completing a life

form. A simple fertilized egg, dividing into various organs, each of which perform complex functions and eventually becoming a life form, is a good enough evidence to show that a life form is not just a total sum of parts. Life is made of divisions from one to many, and from the totality to individuals.

This structure is not unique to life forms, but is commonly seen in nature. If we were to think about live nature, we need to alter the element-reductionist/mechanistic perspective on nature itself. Live nature includes everything from substances, plants, animals, to humans, and is a totality within which all of them are organically linked together. Therefore, we must not separate humans from nature dualistically, but rather consider them as a part of nature. Spiritual activities of humans are expressed as physical actions, and the physical actions are connected to the external environment. Spirit and material, mind and body are not something that can be dualistically separated, but closely connected. If anything, the totality of them should be considered as nature.

Organicism

Organicists such as Ludwig von Bertalanffy were the first ones to strongly insisted that, the totality was more than total sum of parts and was capable of showing functions that were absent in parts, and that these facts were extremely fundamental to life forms. Organicists consider that the reductionistic mechanism way of thinking can never comprehend life phenomenon, because it analyzes them parts by parts before contemplating on the totality. They consider life phenomenon to contain something beyond such way of comprehension.

In organicism, the most important concept is what is called 'organization.' Molecules are organized to become giant molecules, which are organized to form organelles, which are organized to form cells, which becomes organs, which are eventually organized to complete a complex individual. In each step, the higher level of organization it become the more complex and new characteristic will be exhibited in an organism, and such organisms are what life forms are. Moreover, the higher system does not get rid of the lower systems, but rather organizes and controls them within it, in order to form a new system. The reason why life forms exist as organisms is because such total control, namely the function of organization, precedes elements. Preservation of life means nothing but the maintenance of this overall organism that organizes individual parts.

Indeed, this organicist theory has superior way of thoughts than mechanism or vitalism, in terms of providing explanation to life phenomenon. Simple physicochemical/mechanical bonding of substances is not sufficient for the creation of life forms to begin with. Life forms are created when they are organically organized and new systems are formed. Moreover, new systems must show

characteristics that did not exist in the original systems, if it should be a life form. That is because parts cannot be parts without the totality. Organization is this function to organize the totality. Organism is the orderly totality each part is organized into, and life phenomena the characteristics this totality exhibits. Organicism should be given credits for attempting to construct the theory of life phenomenon through focusing on the organization function in life forms.

Especially, the organicism theory Bertalanffy had developed, has opened a new path for perceiving life forms as an open system, and eventually became systematized as a general system theory [1]. It suggests that, by considering life form as an open system that is maintained by input/output of substances and energy through interaction with the outside environment, life phenomenon can be elucidated. However, even with this oraganicism theory, the reason why the organization function, namely the organization of element parts takes place in the open system is yet to be unclear. Organicism theory fails to provide any sorts of explanation on this issue.

Self-formative Ability

The process of protein production within life forms has already analyzed into details by molecular biology. However, such physicochemical investigation is not always sufficient to elucidate life itself. No matter how detailed the investigation of molecular-biological structure is, it never elucidate as to why the structure is created the way it is. It is certain that the molecular-biological structure is responsible for the workings of life, but still, we must think of the formative force that makes the structure the structure, and operates and organizes various molecules. That is to say, life is not so physical, but is the formative force that organizes these physical substances.

Moreover, according to today's molecular biology, DNAs keep the record of all necessary information to direct the composition of protein essential for making an organism. Within those proteins, there is even a type of proteins that produces an enzyme to suppress the composition of protein. It is believed that those enzymes counterbalance with the substance that accelerates the protein composition, in order to maintain the amount of protein at the proper level. However, no matter how much of these complex structures are elucidated, it does not provide the explanation of the organization force of life itself. Rather, the more evident the function of such delicate control devices become, the more we must consider the existence of immanent formative force that organizes them.

Also in the case of considering the evolution of life forms at the DNA level, it is believed that DNA reads in the changes in the environment and increases the message part of genes by altering its functioning part, and by making various new combinations with these increased genes, creates a new

life form system, and as a result brings the evolution. However, even if it were correct, the question of how DNA reads in the changes in the environment, recombine its own genes and creates a new system to cope with the situation still remains. This is not something that can be elucidated by simple analysis of structures and functions of molecules.

Life forms exhibit mysterious phenomena in both genesis and hereditary phenomena. In the experiment conducted by Hans Driesch, which later became famous experiment as the starting point for the advocacy of the neo-vitalism, we witnessed a fertilized egg of a sea urchin severed into two halves, both of which then grew into a complete larva. A cell taken out from an embryo of a sea urchin grown to a certain level also grew into a complete larva. These results suggest that even if an experimental disturbance is applied to a fertilized egg, it is capable of controlling the disturbance and retain the order.

In another example, we know that Drosophila has a single recessive mutant gene, and if two of this recessive mutant gene made a pair in a fertilized egg, its posterity will become a fly without eyes. When hybridizing within the pure line of eye-less flies, the entire lineage will have the eye-less gene only. Notwithstanding, after a few generations of hybridization within the same eye-less lineage, flies with completely normal eyes start to appear.

These strange phenomena in embryology and genetics also are subjects for the contemporary biology to elucidate in molecular level from the linkage of genetic functions. However, even if these strange phenomena became explainable with the omnipresence of special genes or the substitution function of genes, there still are no physicochemical explanations to the question of why genes are equipped with such order restoration ability.

Purposive Formation of Order

Life forms ingest substances from the external environment and synthesize substances that compose themselves. Also, they decompose substances of both external and internal origins and live off of the energy gained in the process. The process of substance changes in both assimilation and catabolism, namely the structure of metabolism is biochemically elucidated today, to the details, for both plants and animals. In association with this metabolism, energy conversion takes place within life forms. Life forms convert the chemical energy of ATP (adenosine triphosphate) generated by fermentation or respiration to various types of energy such as work, heat, electricity and light and perform their biological activities. The structure for this energy metabolism also has already been analyzed into details.

Automatic metabolism of both substance and energy is another essential characteristics of life. However, then, how is it possible for life forms – from unicellular life to multicellular organism – to perform these tasks automatically according to such complicated system?

Among the diverse characteristics that define life forms, the minimum abilities required will be abilities of energy conversion, self-preservation and self-reproduction. Based on these abilities, other special qualities that characterize life forms, such as reproduction, generation and growth, adjusting and regulating, reactivity, metabolism, and repair ability start to appear. Moreover, life forms are capable of performing these functions automatically. The fact that life has this ability to make itself work is where autonomy and identity of the living organisms exist. Life forms put substances in order with this active force. On top of that, this order formative ability of life forms is never purposeless, but rather always has purpose. Purposive order formative activity is the essence of life.

However, when it comes to the ultimate question of why life forms are equipped with such purposive order forming ability, we still have to admit that we are ignorant. Life still carries the mystique beyond the rational investigation of human beings. We must refrain from thinking that physicochemical methodology is capable of solving all the mysteries of life.

Even if we reduced this order forming ability to molecular level and thought about it, the macromolecule called DNA is an order forming entity on its own, and it is unclear as to where the order formative function comes from. Rather, we cannot help but to think about a force that is immanent within those substances that forms DNA. If we hypothesized that such order forming ability exists within these substances, it is understandable that these substances evolved to form macromolecules and acquires various characteristics that are unique to life forms, such as self-reproduction ability. G. W. Leibniz's idea that *entelecheia,* or the soul, exists even in the smallest part of substance may not be so absurd after all [2].

Suppose I started running towards a certain destination. When doing so, the muscles on my legs will for sure actively stretches and contracts to contribute on my progress towards the destination. Moreover, in order to move these muscles, the blood within my body will frequently circulate to deliver oxygen and to process wastes. Mechanists tend to conclude that the reason why I am able to proceed towards the destination is because of works of the muscles on my legs. However, the reason why I am able to proceed towards the destination is rather because of my will to keep those muscles moving. Without such purposive will, no muscle will move.

Similarly to this example, life activities are certainly conducted by substances. Nevertheless,

substance activity is not the only thing that is responsible for conducting life activities. It would not be sufficient unless we consider the force that enables such substance activity, and that exists within substances. Out of numerous substances on Earth, a very few elements were selected. They were organized to form organic macromolecules, which were organized to form cells. Cells are then organized to form organs, and organs are to form life forms. In such case, the force to organize the life form will be essential. Moreover, this force must be a purposive force that is continuously working towards a certain purpose, such as self-conservation or adaptation to environment.

The further we study into life phenomenon in mechanist way, the more problems come out, which cannot be explained with mechanist theory. The concept of purposiveness that is unique to life phenomenon is one of these problems. Life forms have, unlike machines, purposiveness within themselves. Life forms express it in its forms, structures and functions.

The permutation of the arrangement of macromolecules that compose the nuclear acids of DNA and RNA counts up to enormous numbers of combinations if we relied on physical coincidences. However nature processes those combinations easily and orderly creates nucleic acids and write information in them. If that is the case, we need to consider that it does not form by coincidence, but does with a certain purpose.

When generating proteins, life forms skillfully bonds amino acids to create the necessary protein. In this case also, amino acids are not bonded purposelessly. If they were bonded without purpose, the number of possible combinations would also be huge, and that it would be impossible to create proteins that serve the purpose in a short period of time. Composition of proteins is also a purposive activity. Life forms are created with purpose and a plan.

In cells that compose a life form, many complex phenomena take place in orderly fashion in order for the cell to sustain itself. Moreover, these cells transform into muscle, viscera and nerve cells in such an ingenious way. Cells, too, carry a purpose that is beyond themselves within, and are working in such way that they serve their purposes. The same logic fits the case of organs all the more, for they are created to and works to serve each of their purpose.

Metabolism for both substances and energy are conducted in such way to serve the purpose of self-preservation against environmental conditions. Whether be it animals or plants, the forms of organisms are created to fit the environment the organism is in. Moreover, during their morphosis, changes in each part are always executed towards the appropriate form in the future and in orderly manner. Such purposive compatibility of life forms is not something that can be sufficiently

expressed in mechanist methodology.

Moreover, since the birth of life on Earth, from the most primitive prokaryote to the most complex mammal, the evolution was in the direction from the simple to the complex over a long period of time. This fact also suggests the effort with a certain directivity made by life. At least, it seems that it was not made by coincidence, but with a certain purpose.

The Limitations of Teleology

From the formation of DNA to evolution, life forms commit to purposiveness. Moreover, unlike machines to which the purpose is given externally, life forms find their purpose within themselves and work automatically. The purposiveness is immanent in the life form itself. Therefore, there is no need to establish the purpose configurator other than and outside of the life form. Though life forms are thoroughly purposive existences, it doesn't mean that the establishment of external and transcendental purpose other than the life form would be necessary, as the final cause to form life forms. The purpose of a life form exists within the very life form, and if we further investigate into its origin, we would have to think that life forms exist within the very substances, from which they are created.

Life forms are consistent to purposiveness, in the levels of individuals, of species that are common between individuals, and of the current of life that connects each species. However, we shall not think so far as to this purposiveness that is immanent in life forms are designated by some transcendental designer, or a creator different from life forms. We shall not assume the existence of some transcendental being who had given the purpose to life forms. We shall not think that life forms have been plunging forward towards the final goal given by this transcendental being, or that they will continue at it hereafter. In such extreme teleological theory, life forms would become mere puppets, which works just as the transcendental being had designed. It would mean that all life forms are only realizing what had been planned by God.

Life forms are the ever-changing flow itself, and the purposiveness is immanent within the very flow of life. The extreme teleological theory that stands outside of the flow of life and thinks of it as movement pre-arranged by the design of some transcendental being, would be too superficial. Such explanation would define everything to be pre-arranged events, and there will be no accidents or freedom within the flow of life. After all, such extreme teleological theory would be led into another determinism, different from the mechanist theory.

The flow of life is not something that can be grasped violently by a certain external principle, or be

reduced down to it. There is no necessity to premise a configurator behind the purposiveness of life forms. Purposiveness is naturally equipped within the efforts made by life, which constantly tries to preserve itself thoroughly through each individual. The phenomenon of life's evolution is also made possible by such immanent self-forming ability.

As far as that goes, the flow of life has a kind of inevitability in a kind of tendency to form itself unidirectionally. However, this inevitability is neither the type of inevitability in the sense that life forms obey physicochemical/mechanistic laws, or that of the plans and goals prearranged by God. Life has, within itself, the directionality to preserve, sustain and create itself. This very directionality of self-preservation and self-creation is the inevitability for life. In that sense, this can also be recognized as freedom at the same time. Under the flow of life, the conflict between the inevitability and freedom will be cancelled.

Life freely adapts itself to the continuously changing surrounding environment, freely creates new forms through evolution, and vigorously lives on. This freedom of life surpasses both mechanistic and teleological determinisms. However, life will never get rid of its tendencies to live, to preserve itself and create itself. It is incapable of doing so. In this sense, this tendency of life is inevitability in the case of life forms.

During the long history of Earth, the environment of the outside world changes violently and rapidly. None of these changes are predictable for life forms. The changes in environment appear as accidental events for life forms. In order to cope with these events, life constantly tries to change itself. Mutation of genes is one way to cope for the self-formative ability of life, which tries to adapt to the accidental changes of the environment and change itself by creating new forms.

Thus, life is capable of freely changing its form in order to cope with the surrounding environment. In this sense, life is very free. However, what kind of form will be employed is a dependent to the interaction with the certain environment, and life forms are incapable of predicting beforehand. This, in a sense, is both contingency and freedom for life. Life's inevitable tendency of self-preservation exerts its freedom when it meets the accidental changes of environment. Freedom exists in the interplay between inevitability and contingency.

2. The Energy of Life

Life's Order Formative Ability and Entropy

Whether plants or animals, life take in and excrete substances, energy and information from its surrounding environment, with which it continuously interact, while trying to form and sustain its own order. With regard to this, animals as well as plants, or even protist, sustain their lives through actively influencing the environment not only by simply adapting to it, but also by extracting the necessity from it and changing it. A life form is an active entity, and is an active force that organizes substances into a complex order.

It is often said that life forms do not obey the second law of thermodynamics, namely the law of entropy increase. It describes the subjective/active order formative ability of life. Indeed, as simple substance will, as long as it is within a closed system, obey the law of entropy increase, that is to say, it irreversibly heads for disordering/averaging. However, life forms created out of these substances are heading for the direction of ordering/organizing, that is, the direction of entropy decrease.

For example, photosynthesis, the activity of taking in carbon dioxide and water and producing carbohydrates using the light energy to produce the material for cytopoiesis, also is heading for the direction of entropy decrease, as long as its aim is at increasing of order. Also, the activity of a live embryo, which takes in energy from the outside to continue cell division, eventually forming more complex structure, is also an act against the law of entropy increase. Moreover, from a molecule to gene, organelle, cell, organs to a multicellular organism, life has continued to progress towards the direction of complication. Life irreversibly ascends from dispersion to accumulation, and from disorder to order.

Of course, when the very order formative ability itself, namely the life function itself comes to stop, even life forms will meet their death, become mere objects and rot away, and head towards the direction of disorder and averaging. In that sense, even life obeys the law of entropy increase ultimately.

However, the effect of death had started to be seen only after life forms invented the highly sophisticated method of self-reproduction known as sexual reproduction. In sexual reproduction, the more complicated it became, the clearer the differentiation become between parents and children – between generations. As the newer generation is created, the older gets abolished. Although in the process of abolishing the older generation, life does obey the law of entropy increase, it is not necessarily the case for the newer generations. Considering the fact that these newer generations had grown out of the fertilized eggs of their parents, life forms are continuum beyond generations. Focusing on this everlasting flow of life, it is possible to say that life has been continuously resisting against the law of entropy increase for four billion years, ever since its birth on Earth.

In fact, protists, which do not practice sexual reproduction, has no difference between a parent and a child, since it self-reproduce through cell division. Therefore they are free from the idea of individual death in principle, and are continuous as a life phenomenon. Hence, protists have, since their birth to today, continued to resist against the second law of thermodynamics and kept their life activities.

Moreover, starting from these primitive protists, life has been resisting against the law of entropy increase in the form of continuously evolving towards the direction of complication. Of course, there have been species became extinct. Those extinct species had obeyed the law of entropy increase in the form of going extinct. However, looking at life as a whole, their extinction concurrently stood for the creation of more complex new species, which meant the resistance against the second law was continued. Life is an activity that tries to create order from disorder, and to overcome the physical causality.

Of course, life forms are not the only thing that has such order formative ability. In any systems similar to life forms, which take in and excrete out energy, substances and information to and fro the outside world, namely in any open system such ordering function could take place. The ordering in life phenomena also can be uniformly interpreted as one of the phenomena in such open system. Generally, when an open system transfers to a certain steady state, entropy decreases. Heterogeneity and complexity voluntarily appear and the system will automatically moves to a higher order.

However, the open system theory may not be sufficient to elucidate everything about life phenomena. It does explain that the order increases when entropy decreases. But still, the open system theory does not provide a complete explanation as to why each individual life form respectively takes various order and form.

Life remains mysterious and is full of enigma. Since the old times, philosophy has been trying to grasp life phenomena, and ultimately contemplated on the driving force of life in some form. It probably was based on the self-awareness that life phenomena could never be grasped fully by any methodology, whether physically, chemically, mechanically or mathematically. The idea of *entelecheia* introduced by Aristotle and Leibniz, as well as the idea of *élan vital* (leap of life) presented by Bergson are both indicating the limitation of physicochemical/mathematical explanation on life.

Metabolism and Formative Force

The most essential activities for life activity would be the metabolism of both substances and energy. Life forms sustain its life by taking in substances from the outside world and composing substances that form the life form. They also decompose substances gained by the composition or from the outside world to gain energy, which will be used for their actions, composition of body substances and fermentation. This function unique to life forms can be seen similarly, from in DNA's molecular level through the higher levels of multicellular organisms. Moreover, this structure of metabolism has been elucidated to details by the development of biochemistry. Metabolism, that is, the reservation and the continuous consumption of substances and energy, is an essential function for life forms, and unless continuously doing it, life forms are unable to survive.

What is more, metabolism is in a way a very intense activity. Because of this replacement of substances and energy, in the case of the human body for example, most of cells get replaced by new ones in a relatively short period of time. This suggests that life is not the substances that forms it, but the very function that continuously drives the replacement of substances and energy. Even if one argued that the function is a mere program written on DNA, the very program is what consist of the interrelation and chain of the information written, which are invisible to our eyes, unlike substances. There must be some kind of an invisible force. The life phenomenon we call metabolism is also one of the self-expressions of the invisible active entity, that is, life.

Moreover, the self-formative ability of life has variety of expressions, while the ability itself is sole and unchanging. Tanking the substance assimilation function for example, there are green plants that practice photosynthesis utilizing chloroplast, as well as purple and green sulfur bacterium, which utilize bacteriochlorophyll or chlorobium chlorophyll to resolve hydrogen sulfide for carbon dioxide assimilation. There is also purple non-sulfur bacteria, which resolves fatty acids for their carbon dioxide assimilation. Furthermore, light energy is not always essential for assimilation functions. There are bacterial groups that utilize the chemical energy produced through the oxidation of ammonia or nitrous acid, or the energy from deep inside the earth that comes out from the hydrothermal vent in deep sea floor. In brief, even in the limited subject of assimilation function, life shows an unchanging directionality in terms of the work to take in substances and to utilize them in order to survive, while in order to achieve the goal, it would utilize any substance or energy available. This is a sign of life's strong desire to survive.

Likewise, within the photosynthesis of plants, its reaction process is extremely complicated. This complicated reaction is carried out in a corpuscle known as a chloroplast, which is about one two-hundredth of a millimeter in size. If it were possible for us to artificially recreate the reaction

similar to photosynthesis, we would need an enormous factory to make it happen. Even within a single chloroplast, we cannot help but to feel the immeasurable force of nature.

Homeostasis and Interaction

Life is a fluid being that consistently changes. Concurrently, however, it is also a fluid that attempts to maintain stability within the change. Just like a gymnast walking on a balance beam, the flow of life continues its progress while keeping its stability despite its constantly meeting unstable changes. It is not the stability in a state of rest but in an active state, that is, so to speak a fluid equilibrium. This is the reason why life forms needs to sustain themselves while always interacting with the external environment.

Life phenomena known as substance metabolism or energy metabolism are also the types of interactions. Life forms sustain themselves, under their interactions with external environment, exchanging substances, energy and information constantly. Life forms are exposed to the constant changes of environment and its instability, because they sustain themselves through interaction with the environment. Nonetheless, however, life forms keep fluid stability within their internal environment. In order to keep this internal stability against the external instability, life forms contrive various means. The system to sustain constancy widely known as homeostasis is one of them.

Life forms perform adjustments to keep their internal environment consistent regardless of changes in external environment. Though the means differ by species, the mechanism becomes more difficult in proportion with the level of the life form gets higher. Mammals keep stability in items such as osmotic pressure and acidity of body fluid, body temperature and blood sugar content. When a change in external environment affects the internal, a countervailing reaction will take place, thus cancelling the change, and keeping the homeostasis of the internal environment. Such adjustments are mainly executed by nerves and hormones. Moreover, plants germinate, grow, flower and bear fruits in certain seasons as reactions to their external environment such as light and water. This kind of adjustment seen in the growth of plants is executed by plant growth regulator (plant hormone). Biochemical analysis has elucidated to the details of those homeostatic systems of animals and plants, of which their interaction is the essence.

Internal organs of a living thing respectively have autonomous functions, and at the same time hey interact with each other to form the entire individual. Each organ is capable to move freely to a certain degree, and they form the fluid order of the whole by communicating information with each other. Homeostasis also is kept by interactions between each organ. Such adjustment function is not

something that can be executed by the command of a single organ, nor by a single substance. It rather naturally happens as a result of various organs and substances interacting with each other. If that was the case, the essence of life being life is, if anything, in these interactions, and not in some organ or substance. Rather, the very ability that orderly organizes various organs and substances and makes them interact with each other is what we should recognize as life.

Furthermore, such ability is not necessarily immanent in the program incorporated in genes. The information incorporated in DNAs is mere initial condition, and for this condition to acquire meaning and start working, the promoting from the environment is necessary. This 'environment' could be both external and internal. DNAs also are life forms that act upon their interaction with the environment. Therefore, we cannot designate DNAs as the sole substantial origin that entirely control life. In fact, it has been elucidated that life forms exhibit a certain function when the changes in external environment brings changes in the internal environment, causing secretion of certain type of hormone, which then affect a certain gene within the nucleus to express the command.

If so, the source of life phenomena is not something that can be specified in some substances, such as DNA, for example. Rather, life function is in the interaction of various substances. Life phenomena are formed by circulation, and in most cases it is impossible o clearly decide what is the cause of what. Rather, we must think that life is the cyclical interaction, in which things could be both cause and result for each other. Moreover, this interaction is invisible to our eyes.

Morphosis and Energy of Life

Nevertheless, life is not limited to just being an invisible force. If it were the only form life stays being, it would never be recognized. Conversely, life expresses itself in vast variety of visible species. Moreover, the essence of species is in their forms. The various species of living things are distinguished by their forms. Though the individual life form is destined to eventual death after divisions and reproductions, these are the same divisions and reproductions that regenerate life, and thus the form is inherited from an individual to the next individual, sustaining the species. Whether plants or animals, all species of living things reproduce their unique form through each individual, regardless of changes in locations or time. On top of that, the complex functions inside life forms contribute to the making and sustaining of their forms.

The self-formative ability of life forms that attempts to reproduce their own forms as much as possible despite the changes and disturbance in environment can be often observed in a phenomenon known as regeneration. For example, if a flatworm was cut in one-sixth, a hydra in one-twentieth, or a planarian worm in one-two hundred eightieth, they will all regenerate back to a complete

individual from each cut piece. Sea squirts and asteroids are known to have similar ability. It is as if the totality is dwelling in each part of their body. Of course, the higher the level of animals the less of such regeneration ability is observed in life forms. But still, for example, if an eye of a crayfish was cut off with its ophthalmic nerve ganglion left, a new eye will regenerate on the same part. However, if the ophthalmic nerve ganglion was cut off along with the eye, an antenna will regenerate instead of an eye. In higher animals such as humans, such regeneration ability is seldom seen. Nonetheless, remaining of the regeneration ability from the primitive times can be observed in regeneration of skins and liver cells. In plants, even in the higher levels of them, such regeneration ability is inexhaustible, allowing them to easily regenerate the original form they ought to be.

The phenomenon known as growth also shows the will of life forms to morphosis. In order to explain this phenomenon, the preformation theory suggests that the information of the future forms of tissues and organs are already incorporated within a fertilized egg. On the other hand, the epigenesist theory suggests that the newer individuals are formed as the differentiation of the fertilized egg progresses.

Molecular biology explains this phenomenon known as morphosis, with the idea of information being incorporated in genes. They suggest that, depending on the species of each life form, their unique forms are originally incorporated in genes as various combinations of information, which are reproduced on the processes of their growth and differentiation. The phenomenon of an embryo's adjustment after disturbance can also be solved by the idea of information being inherent in genes.

The form-related information contained by a certain gene within DNA is delivered to cytoplasm by messenger RNA. Then amino acids will be arranged into right positions at the right timing to form proteins, which will complete a cell. Moreover, each cell only expresses a part of genetic information they carry. A cell picks out a few genes out of many, and seals the rest. For example, some cell would chose the information regarding the formation of retina and becomes a part of an eye, while another would choose a different information and become, for example, a part of the spine. Nonetheless, it is suggested that genes are continuously exchanging information, cooperating and collaborating with each other, so that the life form as a whole will be formed as the totality in a balanced form.

This explanation of growth and differentiation from molecular biology level does provide a solution to the conflict between preformation and epigenesist theories. However, the mysteries of what is selecting a proper part of a gene in each steps, or of why other genetic information are so conveniently sealed and the propitious one alone is allowed to release its expression, are yet to be

solved. It is assumed that the decisive factors may be the complex interaction between genes or with the environmental conditions, but in reality, the structure is yet to be elucidated. Even if it were elucidated, the concepts such as information or interaction are invisible and something beyond substances.

The phenomenon of morphosis carries something that cannot be resolved down to physicochemical dimension. Even if the total information of forms unique to species were immanent in the life form itself, or even in their gene, such information is something beyond physical substance. Similarly to today's physics comprehending substances as a form of energy, we need to consider various forms and orders of life forms formed by substances, namely the information, as a form and an expression of life energy.

3. Evolution and the Flow of Life

Individual Conservation

The formative force of life is the function of never-ending attempt to continue. This function first appears in where an individual contrives various means in order to conserve and sustain the self. Even in the most primitive unicellular animals, there is an identification of friend and foe, which allows them to protect themselves from the enemy and escape from danger. In higher level of animals, they attack and struggle for self-conservation. Defense reaction is one of the expressions of the individual conservation for life forms.

For example, a single-cell protozoa known as paramecium utilizes its approximately twenty thousand cilia to propel its body. When it hits an enemy or an obstacle, it will immediately retreat a certain distance before it stops, turns to a different direction and starts advancing. By repeating this process, it goes forward while skillfully evading enemies and obstacles. Moreover, if an enemy attacked from behind, paramecium speeds up forward to escape. Such action is explained with the changes in the electrical potential within the body of paramecium. However, such action could be comprehended as based on specific will. The higher the level of living thing is, the more complex this defense mechanism for individual conservation will become. Whether fishes, amphibians or reptiles, they all identify enemies, and attack, intimidate, or escape from them as contrivances for the individual conservation.

If the self-conservation function of individual is defined as the function for life forms to keep the self

stable, not only defensive function but also adjusting functions and regeneration ability could also be the self-conservation function of life forms. Organs and systems within life forms are arranged properly for maintenance and conservation of life forms. What is more, they continue to work in a way suitable for self-conservation, while constantly corresponding to changing environment both internal and external, and at the same time changing the selves. That is what makes it different from machines.

Animals' individual conservation through the eating and digesting of food, which allows for internal adjustments, is also one of the expressions of the self-conservation function of life forms.

Even paramecium, if it met the source of nourishment while traveling, starts to secrete digestive enzymes within phagosome, digests the food and absorbs it to cytoplasm through the wall of phagosome. What is left of the digested food within phagosome will be discharged as excrement through cell anus. Also, even though the body of paramecium contains salt, its external environment is mostly fresh water, which means that it is always at the risk of swelling from the water intruding inside the body. Therefore, they discharge excess water from a couple of organelles known as contractile vacuole in order to keep the salinity concentration stable. The body of paramecium made of a single cell is, on its own, a decent system of homeostasis.

Equipped with functions such as metabolism or accommodation, single-cell protozoa such as paramecium are awesome life form system on their own, and they continue with their individual conservation. An automatic machine, no matter how delicate of a computer it is controlled by, is far away from being capable of such life phenomena, in comparison to these extremely small life forms. A unicellular organism is already a perfect life form with a will to live, and is skillful at self-conservation.

Moreover, protozoa have system that identifies friends and foes, and recognizes the self and others. That is to say, they are equipped with the ability to identify their own identity. This ability for self-identification is what enables life forms their own individual conservation. If they lacked this identifying ability, individuals from the same species may fuse with each other, or individuals of different species may unite together, which will result in individual conservation becoming impossible. Life first expresses the self as species, then express the species as an individual. The way a certain life form distinguishes itself and others and attempts to conserve the self must be self-expression of life.

Moreover, in multicellular animals, there is a self-defense system against intruders from the outside

world, such as viruses and germs, known as the immune system. The immune system consists of the humoral immunity, such as serum protein, and cell-mediated immunity, which includes T cells, lymphocytes and macrophages. The immune system of multicellular animals sustains the life form by exterminating intruders by means of automatically generating antibodies against antigens of external origin, such as germs and viruses. Such mechanism of the immune system has been elucidated to the details by today's molecular biology. The immune system also has effect on suppressing occurrence of gene mutation and growth of oncogene with in the body. The immune system is the life form defense system that is effective against aggressive effects of both external and internal origins, and is the system of individual conservation. The function of the immune system is responsible for the conservation of the individual, species, and life of multicellular animals.

In higher levels of animals, not only the immune system but also the abilities of their brains and nervous system also increase, contributing to their individual conservation by protecting the individual from foreign enemies as well as internal disturbance. Moreover, living things without such immune system or cranial nerve system such as plants or protists, and some of the multicellular animals with such immune systems and cranial nerve system, have the ability to repair themselves with regenerative function. The regenerative ability of living things is also a great contributor in overcoming the infringement from the outside world and conserving its own life. For example, crustaceans are capable of regenerating their lost limbs exactly the same shape as they were. Another classical example shows the ability of a cynops' larva, in which if the crystalline lens was cut off from its eye, the cells in it iris transforms into a new lens, which after completion, moves to the designated position to complete the regeneration of an eye. As already mentioned, in case of plants, they are capable of sprouting and regenerating themselves, no matter how many times they were cut and mowed down. The mechanism of such powerful regenerative ability of plants has been elucidated into details embryologically, biochemically and genetic-scientifically. However, as the mechanism becomes more elucidated, the life form's insatiable will for the self-conservation seen in such regenerative ability keeps us ponder more about the wonder of life.

Preservation of the Species

Life is a function that persistently maintains and preserves the self. Though the function of individual conservation is one of its expressions and is present in any living things, the self-conservation function of life cannot be completed as long as it stayed in the individual level. Individual life forms are destined to die and become extinct, which prevents them from completing the function. Therefore, life forms attempt to complete the insatiable function by reproducing a new and different individual from an existing one. Thus, such function is also expressed as the preservation of species by reproduction.

For example, unicellular organisms such as amebae and bacteria repeat self-reproduction by means of cell division. They continue dividing as long as food is supplied, and repeat self-reproduction. There is no such thing as the death of an individual. However, even in this case, when the first individual splits to become two, the first one cease to exists as the result of division. This is another example of life trying to make more individuals out of one, in an attempt for the preservation of species.

For the case of living things that practice sexual reproduction for self-reproduction, a reproductive cell separates from an individual, and by fusing with another reproductive cell from a different individual, it produces a fertilized egg, which will then become a new individual after differentiated. However, in the case of sexual reproduction also, the process of a new individual being created out of an existing one stays the same. In sexual reproduction, the older individual will eventually die and be abandoned, while the new individual will succeed the life and form. Life persistently tries to preserve the self, by sustaining the species through death and regeneration of individuals.

In the higher level of sexual reproduction, life forms start to have individual lifetimes, in which an individual creates a new one – offspring from its own part, becomes old and eventually dies. Here, life appears as the function that sacrifices the survival of an individual to produce new ones, in order to conserve the species forever. On top of that, such function dwells within each individual.

Individuals attempt to preserve life by repeating death and rebirth and to constantly reproduce the unique form of the species while doing so. Though each individual will have its death, life itself seems to be eternal. Each individual has its unique character, and through the reproduction of a particular individual, more individuals with unique characters will come to life. Even so, throughout the repetitive process, the common form of the species will be sustained. That is what the continuity of life is about.

Life reproduces new individuals to go beyond the limited lifetime of an individual, and thus sustains the characteristic of the species. It is nothing but a miracle of life to have the self-reproductive function in order to maintain the species and sustain life, especially in comparison to machines. The mechanism of reproduction has already been elucidated to the details by molecular biology to the molecule level. DNA strand splits and unites with another split DNA, and the genetic information inscribed on the united DNA is duplicated. Then, based on the command, a new individual will be formed. That is how the life-maintenance phenomenon of species is comprehended.

Even if the scope of life phenomena was limited to the preservation of species, we can observe a plenty of various means contrived by each species in order to sustain the selves. For example, in any living organism, each individual attempting to form a large group in order to survive is taking an action suitable for the life preservation of the species, in terms of adapting to the environment and defense against the foreign enemies. So-called 'social insects', such as ants and bees build a society in the group so tightly connected that acts as if it were a living organism on its own. They keep the society so tightly that if got out of it, an individual would not be able to survive.

The struggle between species over food or living space also occurs due to each species' function to persistently preserve its own life. Moreover, each species will start to segregate from each other and to scheme for paragenic relation. This paragenic relation will eventually develop into symbiotic cooperation, which can be seen in examples such as ants and aphids, or legume and nodule bacteria. In the example of Lichenes, which consists of algae and fungi, the symbiosis is so advanced that it looks as if they are a single life form. Also, there are examples of viruses and parasites, which gain most of nourishment necessary for their survival from their hosts. Species contrive various means for the maintenance of their lives, but one thing for sure is that, there is no species that wishes for its own extinction. Species persistently attempt to sustain their own lives through death and rebirth of individuals as well as competition and symbiosis between different species. That is indeed the expression of will to live forever.

Evolution

Nevertheless, the preservation of species still is not sufficient to conclude the function of life that keeps attempting to last. Global environment often undergo sudden and violent changes, causing many species to be annihilated. However, life responds to this crisis with the strategy known as evolution in order to further accomplish the maintenance of life. Even if one species was annihilated, life will create a new one, so that life as totality can continue on permanently.

Approximately 3.5 billion years ago, unicellular prokaryotes without nuclear membrane around their genes came into existence. Soon, they were followed by unicellular algae, which were capable of photosynthesis utilizing chloroplast. After a long time had passed, eukaryotes with nuclear membrane around their genes started to appear, and many unicellular protists were born. Thereafter, eventually, multicellular organisms with superior systems started to appear, although it took over two billion years until the very first multicellular organism made its appearance. However, once multicellular organisms started to appear, the flow of evolution was accelerated rapidly and became highly diverse. Living organisms ramified to plants and animals, and after experiencing a few major extinctions, produced diversified world of lives both underwater and on land. Through the

magnificent drama of the evolution, countless variations of living things had been born, prospered and gone extinct. For example, dinosaurs, a kind of reptiles, first appeared on earth approximately twenty-five hundred million years ago, and prospered until they met their extinction at the end of the Cretaceous period, which was sixty-five million years ago. The next ones to prosper on earth were the mammals and birds, and the human race was born from the primates, which was at the edge of mammals.

In order to comprehend such grand mechanism of life's evolution, the neo-Darwinism employs principles of mutation, natural selection and the survival of the fittest, for their explanation. Genes constantly mutate for various reasons. Among those mutations, genes that express form and nature that are advantageous for survival under a certain environmental condition will be kept, while those disadvantageous will be eliminated. Individuals with advantageous genetic traits will win the struggle for existence and leave many offspring. After repeating this process many times, advantageous traits will be gradually accumulated, eventually resulting in the formation of a new species. Their theory suggests that, life has evolved through the process of each generation of accidentally mutated genes being screened in the struggle of life, and selected by the environment.

Nevertheless, it is doubtful whether the neo-Darwinism explanation of evolution that utilizes mutation, natural selection and the survival of the fittest is truly describing the fact of evolution or not. For example, if the fittest to the environment did leave the most offspring and bring evolution as a result, we must consider the case of protists such s bacteria, which, since its birth, has successfully survived through numerous violent changes of the environment and continued for billions of years, exhibiting highly active breeding potentiality. If the one that leaves the most offspring were the one who survives through the screening of natural selection and entitled for evolution, living things on earth could have never evolved beyond the stage of bacteria. However, as a matter of fact, bacteria were left as they were while the rest of living things on earth progressed far beyond.

The fact that living things evolve from one stage to the higher next cannot be explained simply with 'the survival of the fittest' or natural selection. The idea of the adaption to the environment also fails to provide a convincing explanation for why the sophistication of living things, namely evolution occurs, because if the issue was about the adaptation to the environment, the lower level of living things tend to be better adapted and longer living. Moreover, in the reality of the evolution of living things, in unicellular as well as multicellular organisms, the more primitive ones do not always get eliminated but rather left as they are and accumulated, so that in most cases the more complex species of the next level could be created based on them. For that reason, from unicellular organisms to vertebrates, there are many species concurrently existing in various stages, and they all live in a

very intimate ecosystem, where mutual existence is essential to each other – in the community of life. Of course, there are many species that could not adapt to sudden and violent changes of the environment and went extinct, but also there are many species that escaped annihilation and have been continuing with their lives for billions of years. Such fact cannot be sufficiently explained with the theories of mutation, natural selections and 'the survival of the fittest' alone.

Moreover, the evolution of living things can often be overdone, resulting in the creation of forms that seems to be inconvenient for the survival of the species. For example, living things with forms seemingly inconvenient for their survival, such as gigantic ammonites, could sometimes appear, and add to that, they survive for some time. The reason why such inconvenient form was created and was able to survive despite the screening of natural selection cannot be explained sufficiently with just the theory of natural selection.

In addition, life constantly works extra and sometimes creates unnecessary forms. For example, animals such as camels, deer, giraffes and cows have multiple stomachs to ruminate grass they had eaten. Multiple stomachs are, in a sense, unnecessary character in terms of adaptation to herbivorous. And yet, 'the survival of the fittest' and natural selection theories fail to provide a convincing explanation as to why such mammals with multiple stomachs were created. Both horses with single stomach and cows with multiple stomachs equally adapted themselves to the environment and successfully survived to today. Having multiple stomachs is not a trait necessarily advantageous for leaving more offspring. It seems as if Nature is fond of playing.

Moreover, as it is often referenced, there is the issue of vertebrates' eyes, which have been the trouble for all the evolutionists since Darwin. That is to say, it is impossible to declare that the astonishing combination of organs composing an eye, including the retina, rod cell, cone cell, lens, iris and pupil was the result of pure luck, in which mutation of each part just happened to coincide for the evolution. The possibility of such coincidence happening is not much more than zero. The same goes to the sophisticated functions of enzymes inside living organisms or the complex nervous system of vertebrates, both of which are way too sophisticated and too delicate, to think that they are the results of simple accumulations of accidental mutation.

Life forms seem to have been supported by the directionality towards total and organized evolution, aiming for various purposes. Even taking under account all the natural selections, combined with accidental mutations, accumulated throughout a several hundred million years of geologically lengthy time, they still fail to become the convincing reason for the evolution of forms and functions. It may be the changes in the environment on earth or genetic mutations, but in either case they are

accidental events to life forms. Sophisticated orders seen in every stage of life forms can never be created from such accidental events. It is stochastically impossible. Though the changes in life forms caused by mutations and natural selections may be playing a certain role in the creation of irregulars within the same species, but it is not sufficient to explain the evolution that goes beyond the limit of the species. Nevertheless, the reason why the Darwinism predominated in the argument of evolutionary theory may be because, the modern natural science was dominated by mechanistic perspective on nature, while the modern industrial society was ruled by the concept of free competition.

Macroevolution

As it is often said, the theory of evolution based on mutation and natural selection does provide a certain degree of explanation for the microevolution, in which a new species is created from a mutation within a single species. However, it is difficult to apply the same explanation to the macroevolution, such as of birds and mammals evolving from reptiles. According to paleontology studies, macroevolution tends to take place in a certain period an in a large scale. Therefore, species is the only distinction that can be made in the fossil groups found today. New species appears suddenly, and for a few million years thereafter, their forms show little change. Living things do not create new species on the constantly repeated mutation, but rather stay unchanged for a very long time and then create a new species all the sudden.

For this reason, it is hard to find a group of fossils that would show consecutive changes from one species to another in a paleontology researches, and in the diverting point where the appearance of a new species is expected, what is usually found instead is the absence of fossils. Of course, there was the discovery of the archaeopteryx in between reptiles and birds, but the samples are scarce, and can only be found a thin stratum, which symbolizes the time of their existence being relatively short. Nonetheless, according to the achievement of recent molecular evolution studies, the signs of consecutive changes along the phylogenetic tree can be observed at the levels of nucleic acids and proteins. However, there has been no sufficient explanation provided in molecular evolution studies, too, as to why sudden and unidirectional mutations occur, causing major changes in forms and characteristic.

The accumulation of accidental mutations and the natural selection are not enough to provide a convincing explanation for a sudden macroevolution. In order for a macroevolution to take place, it seems necessary to have a macro-mutation, that is, for example, some kind of a systematic mutation that would affect the early stage of development and modify the form and nature of the life form drastically. In order to explain the macroevolution, it is inevitable to think about the mutation that

has directivity to take the external environment under consideration. This is something that cannot happen by chance.

In fact, the observation of mutation conducted by Hugo de Vries has reported that critical mutations happened suddenly, concurrently and with certain directivity. In macroevolution, if a change was initiated in a tissue, with certain directivity and for a certain purpose, the change will rapidly progress until the tissue becomes suitable to the change. Therefore, systematic mutations with directionality will take place in relatively short period of time, as if to be piled up on one another[3]. Macro-mutation does not take place as an accidental reaction to the environmental change, but rather occurs because of life forms' active approach to it. In that respect, life forms have their own autonomy and purposiveness within.

Although the mutation of genes happens constantly, when a mutation inconvenient for keeping the order of the life form happens, it is usually removed internally to maintain the order. However, once the environment changes, the internal selective function of genes may be systematically modified towards another direction, which could very well be the reason for a new genetic system to be selected. If thought that way, it is understandable that systematic, organic and morphological modifications of all systems, from the nervous, circulatory, metabolic and to reproductive had taken place when, for example, mammals evolved out of reptiles, creating a new form.

Especially, when a new species is created, it is believed that what creates the new form may be some kind of systematic mutation that have happened at the early stage of the ontogenesis of the original species. The so-called 'pedomorphosis' indicates it very well. Life seems as if it returns to where it originally came from, before it takes a new leap towards new direction. It seems that it is the case for the macroevolution. At least, it is impossible to think that the macroevolution occurred based on the gradual change caused by the accumulation of accidental and individual mutations of various parts and functions. Rather, systematic mutations with directivity must have occurred in explosive scale in order to survive the natural selection subjectively, and the new forms and functions created by them had rapidly become fixated. Then, within that frame, those new forms and functions went through changes slowly, until they were completed. This seems to be the only logic that can explain the macroevolution in the paleontology.

Genes constantly mutate with a certain fluctuation, but once when there is a change of environment and they need to adapt to it with macroevolution, genes positively cope with it and mutate actively, systematically and unidirectionally, as if they have a certain will of their own. It is logical to think that there is a single flow of life at the undercurrent of life's evolution, and that it is what diverges

into various paths of evolution at each turning point. The flow of life outflows limitlessly from a single stream to multiple possibilities.

Evolution and Purposiveness

When considering about the positive response capabilities of life forms against environment, or the subjective order formative abilities immanent within life forms, we must not abandon the idea of the inheritance of acquired characteristics, advocated by Jean-Baptiste Lamarck. Lamarck suggested that the evolution of living things is caused not only by environmental changes, but also by factors immanent within them. He suggested that, especially among the physical, technical or life style improvements acquired with effort by a certain living thing, ones that are essential to the survival of the species would be inherited to its offspring. And the evolution of the living thing would occur as the result of the repetition of such process.

Indeed, the contemporary molecular biology agrees that the changes in external and internal environments could, for example, sometimes affect the hormonal mechanism, which would then affect genes and ultimately the manifestation of characteristics. Taking this under account, the inheritance of acquired characteristics is something entirely possible. Normally, acquired characteristics are sifted out and would not leave any effect on genes. However, it is possible to think that some characteristics that happen to be essential for the species may be pushed through the sifter by the long-term environmental pressure and affect genes. If this logic is possible, it could provide explanation to the complicated and delicate inherited skills of animals, such as birds' nest-building or spiders webbing, which are hard to explain with the Darwinism.

Living things make active effort to adapt to the environment. If this effort was what causes the mutation, and if the mutation was inheritable, the sophistication and evolution of the same organ, such as eyes for example, happening concurrently in different streams of evolution process becomes explainable. The same type of efforts made to adapt to the environment by each living thing could affect genes, and the accumulation of it could cause such phenomenon as the homologous sophistication of one organ among different species. Given that, we must again think about the subjective order formative ability of life forms that influences actively to the environment.

If evolution is caused by not the accumulation of accidental events such as mutations and the natural selection, but rather the order formative ability of life forms that actively influences those accidental events, it will be necessary to consider some kind of teleological factor in the evolutionary theory. Life forms attempt to survive by flexibly and appropriately changing their own forms and functions against the environmental changes.

However, this does not necessarily support the idea that the evolution of living thins is happening in order to pursue a certain ultimate goal. It is impossible to say that the final destination of the grand series of evolution from ameba to human is set at God as Point Omega, as advocated by Teilhard de Chardin [4]. It may be possible to look back on the complex process of life's evolution afterwards and place it like so, but it would be too superficial, and too backward, like tracing the evolution back from its result. The purposiveness of life forms is inherent within the flow of life itself, and we must start our consideration from the internal tension of life. For the same reason, it is also impossible after all to fix upon the idea that the totality of nature being the purposive system that sets its ultimate goal on the personified existence of human, as advocated by Immanuel Kant [5]. This idea comprehends nature too human-centrally.

The evolution of life is supported by the order formative ability that always attempts to ascend towards the higher level. The presence of the order formative ability with such purposiveness behind the macroevolution of living things becomes evident when we witness the tendency in an entire species to change, with a sudden mutation that has a certain directivity when the right time arrives.

When an organism tries to react against light, lower animals make eyespots, while vertebrates create very sophisticated eyes. This, too, is life's own expression of will to recognize the external world. Moreover, this 'will,' could very well be the will that may be taking roots to the origin of the universe. The primordial life that has roots in the universe is expressed as each part and each organ of a life form. The totality dwells within each part, and one manifests itself as the separated many. It is a consistent flow that can be seen from the most primitive protists to sophisticated vertebrates. For this reason, even in the primitive monad, a paramecium for example, the primordial form of organs that are present in more sophisticated vertebrates, such as motile organ, mouth, stomach and the anus, can be observed.

It seems that the way a human embryo repeats the billions of years-long grand history of life's evolution, from a monad to fish, amphibian, reptile to mammal, in approximately ten months period, may be related to this primordial flow of life. It seems as if the long-term process of life's evolution up to the birth of the species is stored inside the primordial flow of life and recollected at the birth of an individual. Of course, there will be no inconvenience in interpreting this idea molecular biologically, saying that the past history is stored within the enormous amount of genetic information of DNA, and is making them manifest at each stage of the birth of an individual. The primordial flow of life is passed on from gene to gene, while constantly being accumulated. When a crisis such as the change in global environment happens, life is able to make the best out of it, actively changing

the self and leap forward in the form of evolution. The primordial flow of life infiltrates throughout the tips of every branches of evolution.

Homologous Phenomena and Parallel Evolution

Whether it be the forelegs of reptiles, the wings on birds, the front fins of whales or the arms of humans, the forelimb of vertebrates have various forms and functions. They perform various different functions, including moving, flying, swimming and constructing. Depending on functions, their forms take various different shapes. Therefore, we tend to think that they were created based on different designs.

However, examining their structures from anatomical point of view, surprising similarity can be found between them. The structure of their forelimbs is identical in the basic design, and the similarity can be seen in all constructions of bones, muscles, nerves and blood vessel. Therefore, they are called homologous organs. After all, forelimbs of reptiles, birds and mammals are created from the forelimb of the ancestor of reptile, modified in various ways to adapt to the environment each of them were put in, and to suit the function needed. Homologous organs are created by the interaction between the gene and the environment the living thing was put in. Moreover, it is believed that sometimes they could even be created from the function of completely different genes. All vertebrates are created based on a consistent plan and have the same structure and arrangement. They are merely modifying them according to various functions.

Not only the vertebrates, but also all living things on earth have unnecessary parts at their base, despite the wide variety of evolution forms. Whether plants or animals, all life forms have astonishing diversity and uniformity at the same time. In fact, no matter how many numerous species they are separated into, the life forms on earth are still variations of the same-structured cell, and the cells also will be reduced down to genes with the same structure. Also, from both taxonomical and morphological points of view, all living things share a common original form. The diversity of living things originates in the original form's diffusion to various directions. Life forms is structured from both the diversification of one to many, and the unification of many to one. The diversity exists within the uniformity, and the uniformity exists within the diversity. Many exist in one, and one exists in many.

In order to explain these homologous phenomena, the immanent function of life forms that actively works against the environment must be taken under consideration. The same one function is the one that created various homologous organs – from one to many.

Before the Australian Continent seceded from the Asian Continent, in the late Cretaceous period, mammals branched off from the common ancestor to the marsupial and eutherian. The marsupial mammals proceeded along their evolutionary path in the Australian Continent separated from Asia, and so did eutherian mammals in continents other than the Australian. Thus, mammals were separated in to two categories, the marsupial and eutherian, and continued evolving for the next one hundred million years or so separately. However, the forms of animals created during the process of their evolutions showed surprising similarities between the Australian Continent and other continents. For example, some marsupial mammals, such as the jerboa-marsupial, sugar glider and Tasmanian wolf show close resemblance to some eutherian mammals, such as the jerboa, flying squirrel and wolf, respectively. In other cases, eutherian mammals such as the mole, anteater, giant flying squirrel, cat, wolf and lion also have their marsupial varieties in Australian Continent.

The well-known phenomenon called parallel evolution also indicates well how life is established upon the inseparable relation between the one and the many. On continents other than the Australian, mammals that shared the same opportunity of being eutherian continued on with their various ramifications while adapting to the environmental changes that happened for one hundred million years thereafter. Similarly, In the Australian Continent, mammals that shared the same opportunity of being marsupial continued on with their various ramifications while adapting to the environmental changes that happened for one hundred million years thereafter. In each continent, the life form called mammals ramified from one to many, like a tree branching off. Moreover, the phenomenon that similar characteristics are evident in both eutherian and the marsupial cannot be elucidated simply by the similarity in their environmental changes. It must be considered that the similar forms appeared because the identical tendency was working in the life forms that adapted themselves to the environment. This identical tendency first separated into eutherian and the marsupial, then flowed out as various analogous forms in each genus. Taking this phenomenon of parallel evolution into account, evolution in general is still unexplainable simply in terms of the genetic mutations and natural selection, as the neo-Darwinism suggests.

Symbiotic Evolution

As mentioned before, it is believed that organelles within the cells of eukaryote, such as mitochondria, chloroplast or flagellum, used to be prokaryote living independently, but got inside the cells of other living things with nuclei and started living symbiotically, until ultimately became organelles of the cell. In fact, chloroplast and mitochondria include DNA, which are different in base compositions from the DNAs in the nucleus and carries genetic information regarding self-duplication of chloroplast and mitochondria. Such a fact is also the evidence that these organelles were originally individual living things. It could be that their symbiosis created division

of work, in which the DNA of the nucleus plays the role of brain, mitochondria the heart-like role that controls the oxygen, and flagellum the roles of limbs or sensory organs that cover mobility and reactivity. Different life forms had met, developed symbiotic relation over a few billion years while exchanging metabolites and genetic substance and mutually sharing roles, and eventually they fused as an inseparable single living thing. Of course, such symbiotic life must have been not the first thing to be proposed, but rather a life style that was discovered while many prokaryotes fought with and invaded into each other for their survival.

In fact, similar symbiotic relationship between cells can be observed many situations. For example, inside the Paramecium bursaria, a type of green alga called chlorella lives symbiotically. They continue their photosynthesis activity inside the body of Paramecium, and when the environment gets severe, they provide food for their host and cooperate in supporting its life. Instead, when the sunlight does not reach them, chlorella will feed on the body of their protozoan host. If the Paramecium and chlorella get separated for some reason, each of them can start independent life on their own, but once they are put in the same culture medium together, they will immediately get together and start their symbiotic life again.

Lichens are also a colony consists of algae that creates nourishment by photosynthesis and fungi that depends on it, and are another example of symbion. They seem to be a single life form from their appearance. Lichens have survived through severe environments like high mountains or the North and South Poles, by adapting to them through sustaining such strong symbiotic relations.

Sea sponges are also a colony with a clear division of labor. They are symbion consist of cells that constitute cup-shaped pouches and cells with flagella growing along those pouches. These two types of cells cooperate to conduct life activities such as supplying of water, filtration and excretion, and work almost identical to an individual living organism.

Another well-known symbiotic relation would be the one between termites and a protozoan called mixotrichaparadoxa. Mixotrichaparadoxa decompose the wood masticated by termites and create carbohydrates, which become the source of nourishment for termites. Termites cannot sustain their lives without this protozoan that dwells within their digestive tract. They are not the only example of organisms depending their life support on symbiotic relations, for there are many other animals and plants that do the same. Some of the examples would be the hornets that carry bacteria and yeast cells as their internal symbion, and the nodule bacteria and legumes that live symbiotically.

4. Inevitability, Contingency and Freedom

Contingencies of the Environment and the Activeness of Life

Whether as an individual or as species, life forms are always being exposed to contingencies. From the changes in global environment to an encounter with an enemy, none of the events that happen to life forms are decided in advance, and they are completely unpredictable. However, life forms do not just passively and tamely submit to those unpredictable environmental changes. On the contrary, life forms aggressively and actively act upon the environmental contingencies.

Moreover, when they do act upon, it is not that the ways they ought to handle the accidental event and how they would adapt themselves to it are built in to their genes as their species-unique program. In truth, the amount of programs built in genes is rather a few, and what *is* built in is merely the overall directive for simple survival. The directive for survival built in genes is nothing more than a basic directive, and as for the specific methods of how to cope with a certain environment, each living organism has the liberty to chose whatever the unique method corresponding to each situation. At least, life forms do not let themselves be at the mercy of environmental contingencies, or leave everything up to the natural selection.

From the viewpoint of molecular biology also, for example, the molecular mass and structure of proteins are not decided from the beginning, but are flexibly changing their composition corresponding to environmental changes. Moreover, it is not that such an action is directed only by the DNA within the nucleus alone reading the information. Mitochondria, ribosome, Goldi body and chloroplast are respectively working and making judgments in their unique ways, communicating with each other and corresponding to the environmental change. Genes of DNA within the nucleus dose have the program for survival built in. However, the program is merely a basic one, and without signals from organelles and cytoplasm that scan the external environment, the program within DNA would not be started. Life forms decide on their own directivity based on the interaction between the environment both internal and external, and themselves.

Life forms are indeed constantly being exposed to environmental contingencies. However, at the same time, life forms actively start working on the environment, while quickly receiving signals about it. Life form is such an active entity. Whether the actions of animals, responses of plants or of microbes, they tend to seem as if they are mechanical responses towards and caused by the contingencies of the environmental change. However, in truth, these adaptations and responses must be considered as active working of life entity based on interaction with the environment. Life forms consist of interaction between the entity and environment, and neither the environment nor the program built in DNAs is solely responsible for deciding everything.

Indeed, environmental changes are unpredictable contingencies for life forms. However, the self-formative ability immanent within life forms is, in a sense, corresponding to them in creative ways. That is where the freedom of life is. It should be considered that the evolution of life is also brought about by this subjective freedom of life.

Fluctuation

It may be possible to think that the reason for the constant mutation of genes may be the preparation for life forms to correspond freely to the environment. Indeed, in most cases the mutation of genes happens accidentally as a result of various causes, including the influence of external environment and quantum-mechanical probability of internal chemical bonds. Life forms constantly change, in forms such as mutations caused by mistakes that happen during DNA duplications or alternations in bonding DNAs, and mutations at the levels of chromosome and nucleus. And on top of that, most of those changes are dominated by contingencies. It is believed that the vast majority of mutations at the DNA-level are fixated within the group because of completely stochastic coincidences. This explains why vaccine for influenza is never ready on time every year: Because the influenza virus constantly mutates and new type of virus comes out every year. As far as that is concerned, life forms are dominated also by internal contingencies.

However, such constantly happening fluctuation of genes is a necessary fluctuation for the continuation of life forms, which allows them to correspond flexibly to the unpredictable contingencies of external environment.

While researching corns, Barbara McClintock discovered irregular shaped kernels that do not conform to Mendel's law. It led her to discover the causal gene of the irregularity, which is now known as transposon. It was a type of gene that is able to move around between genes. It also traced the fact that genes fluctuate and not permanent. Transposon can be observed in not only corns, but also in much lower bacteria, as well as in much higher and more sophisticated animals. Immunoglobulin, which is capable of creating numerous antibodies by rearranging its own genes, also proves that genes constantly change, move around freely and fluctuate. DNAs in fertilized egg period also go through reconnection and rearrangement during its process of growth, and are not inherited to each cell as they were. It indicates that genes are not permanent in an individual either.

Such genetic fluctuation is quite possibly the wisdom of life forms to correspond effectively to the environment. Life forms, including their genes, have fairly free range of fluctuation, and are capable of corresponding flexibly to the constantly changing environment. It is as if life forms are preparing

to change for the leap afterwards. Such fluctuation of life forms allows them to continue their lives by creating new species beyond limitation, in response to major environmental changes. Life forms always require the fluctuation, just as a car driver would need some play in the steering wheel, and it seems that life forms are attempting to conserve the self, utilizing this fluctuation. It is not just for life forms, but there have been fluctuations at each turning point for the evolution process of nature, from the creation of the universe, formation of the Earth to the birth of life, and it is this freedom that allows both the leap and the creation of new order.

Contingency and Inevitability

Indeed, contingencies are the most common cause for the mutation of genes. However, we shall not conclude, as Jacques Monod had suggested, that the birth and evolution of life are all merely products of mechanistic coincidences, and that humans are also a fruit of contingency that accidentally happened to appear on the path of evolution [6]. Life forms have active characteristic that would even utilize such internal contingency, while offering their own continuation to it. Otherwise the purposiveness of living organisms, which even Monod himself had no choice but to assume, would not be explained.

At the birth of life, life forms were composed of about ten types of elements out of ninety that existed on Earth. It indeed was a mechanistic bonding of specific elements and may have been caused by accident. However, if everything was coincidence, there will be no explanation as to how life forms' purposive order was created from the accidental bonding of specific elements. It is necessary to consider the existence of the self-creative ability immanent within substances, which put in order the bonding of specific elements and the contingencies of environmental factors while utilizing them, and eventually organizing these elements to form life forms. Moreover, it should be considered that this self-creative ability was not exerted accidentally, but was something inevitable. The purposiveness of life forms also should assume such inevitability.

All life forms on Earth are made of protein consist of L-amino acid, and DNAs twining clockwise, and there are no life forms that are made of protein consist of D-amino acid and DNAs twining counterclockwise. This may also be the product of coincidence. Stochastically speaking, both types of life forms could equally exist, but there is only one of the two in existence on Earth. This asymmetry of life forms is called the 'one-handedness', and may very well be created by accident. That is to say, the first life form to be created at the birth of life on Earth just happened to be the one with the protein consist of L-amino acid and DNAs twining clockwise, and that may be the sole reason why all life forms of today share the same characteristic, as we all will be descendants of it. Moreover, this asymmetry of life may be a function of the asymmetry of the universe, because this

very universe was created from the accidental breach of the symmetry.

At any rate, it should be considered that the self-formative ability immanent in the universe had formed life forms, while accepting such contingencies and making certain inevitable choices. There must have been crossing of swords between contingency and inevitability. Although the directivity to metabolize substances and energy, to maintain order, and to attempt self-conservation through self-reproduction are the inevitability, in what type of environment and with what material those actions are taken are all up to the contingency. Life on our Earth just happened to form life forms with elements such as carbon, hydrogen, oxygen and nitrogen, but in some other planet, it is entirely possible that a different life form is being created from other elements, in a completely different environment. Also, on our planet Earth, life forms were created with L-amino acid and clockwise twining DNAs, but it is not strange to find another planet, in which life forms are created with D-amino acid and counterclockwise twining DNA.

The evolution of life on Earth also has been caused by the interaction between the self-creative ability immanent in life forms and the ever-changing external environment. It seems as the inevitability if focused on the internal ability, since this is a permanent ability immanent in all living organisms. On the contrary, if focused on external environment, it is always accompanied by changes unpredictable for each life form, and in that sense, it is full of contingencies. The diversity of the life on Earth has been created by the interactions, between internal and external, inevitability and contingency, and permanent and variable.

Freedom of Life

As it has been stressed repeatedly, the genetic information of DNA does not mechanistically decide all the destiny of life forms. Life forms cannot foresee what kinds of environmental changes await, and how and in what form they would live in response to the environment is undecided. Another way to put it, these are not decided by the conditions programed previously, but by the unpredictable future conditions. Life is among contingencies, in a sense that these factors are undecided, or decided by the future. However, that is also the very reason why life is free. Life does have freedom, in a sense that it has variety of options to live against contingencies. Conversely, in order to survive through the accidental environmental changes, gene itself mutates constantly in preparation to freely change the way of living.

However, life is also a free existence beyond the determinism in a teleological sense. Life forms are not destined to evolve towards a certain ultimate purpose under a previously set plan. Environmental changes are pure contingencies for life forms, and they are freely choosing the way of life in

response to the contingencies. They do not have a faraway goal or a plan to begin with, towards which they are destined to progress. Rather, if they had such far-reaching purpose or plan from the beginning, it could prevent them from responding to environmental changes. What kind of forms would be employed, and in response to what environmental changes, remains undecided for life forms. In the sense that it is 'undecided,' life secures its freedom as well.

Of course, examining the inside, life forms are orderly organisms, in which each part respectively plays their roles and corporate with each other, and there is a single purposiveness. However, it is not the purposiveness externally given, planned and routed from the beginning. Rather, the purposiveness should be considered as the expression of the inevitable self-formative ability immanent within life forms.

Moreover, not 'all' life forms are dominated by the purposiveness. Life forms often create forms, colors and structure that seemingly have no relation to the purposiveness. For example, the beauty of vividly colored flowers is not necessarily for attracting honeybees that carry pollens, since honeybees cannot see the beauty of them. Also, the elegant patterns of beautiful butterflies are not devised to attract butterflies of the opposite sex, for butterflies of both sexes are unable to see those patterns. It is what may be called the playfulness of nature, and is not a function with a certain purpose. In that sense as well, nature goes beyond both the mechanism and teleology simultaneously. Nature likes to play.

Nature sure creates truly diverse forms in, for example, the leaves and flowers of plants or the limbs of animals. This also indicates that the purposive adaptation to environment is not the only thing that matters to living organisms. The fact that various forms of plants and animals are created in the completely same environment is another proof for it. The playfulness outside of the purpose goes hand in hand with it. Life often does extra things outside of its purpose, and without any specific purpose. That also is the freedom of life.

In both mechanistic and teleological sense, life is a free existence beyond the determinism. Life freely creates new forms, functions and structures while corresponding to contingencies each time. What goes beyond the mechanist and teleology theories; that is what freedom is. The astonishing diversity of life was created by this freedom of life. Forms of life are too diverse and too free, for human thoughts to catch up. The source of the freedom of life lies beyond the determinism theory.

Life forms only include the simple tendency for survival, and the means as to *how* they survive is not at all decided into details, but left up to each species' freedom. Moreover, the category of species is

also capable of exercising fair amount of freedom in changing in order to survive, if viewed from the evolutionistic time frame and in relation to the contingencies of the environment. Life form is a contradictory entity that unifies the permanent tendency and the free changes, as well as uniformity and diversity.

The evolution of life is propelled by the freedom that overcomes the gap between contingency and inevitability. Therefore, unlike the conventional physics or astronomy, it is impossible to predict to which way a certain life will evolve or what type of form they will employ from here on. In that sense, life is nondeterministic. Life simply continues its search for various possibilities of survival in order to cope with the possible environmental changes in the future, and when the time comes, flexibly deals with the crisis and leaps beyond even the bounds of the species. It is what evolution is about.

Evolution is in a sense very similar to a person's life. Living organisms develop themselves, just as a person would do in his/her life, to any direction necessary, in response to the nondeterministic and unknown future. There is freedom and creativity, but at the same time there also is a certain anxiety. Therefore, all the directions taken by the evolution of life have been totally relative; it was not like life has been evolving towards the flowering of human intelligence as if it was the only goal. If that were true, then such a way of thinking would be nothing but an expression of the egocentrism of humans, and not an explanation for the fact of evolution. There is no superiority in the directions of life's evolutions, and they are all relative to each other. Moreover, evolution does not have an external purpose. In fact, life's evolution has been branching out to various many directions, and nobody can know to which direction it will diverge in the future. That is where the freedom of life lies. In a person's life, too, an unexpected accident often leads one to an unexpected course of life. That is where the contingency and the freedom of a person's life simultaneously lie. It is exactly the same as the way living organisms are.

The same single formative force immanent within the life forms proceeds and stops – as if to grope in the dark, through the ever-changing environment, creating new forms to cope each time the change happens, and thus forms the diverse sequence of evolution. Although the immanent formative force is the inevitable, which process shall be taken to implement the formative force is dependent upon opportunities, and is completely accidental. Or, it could be said that a life form has its own freedom in how to cope with the contingencies of external environment by creating what kind of new form. In terms of the directivity to survive and to create, all life forms are immutable. However, how much change should be made to cope with each specific circumstance is up to the freedom of the life form. Just as our personal lives are so, all life forms are constant in terms of the

attempt for their own survival, but since there is no way to know what kind of environmental issue would come up in the future, they all must live constantly corresponding to accidents. Life forms are constant in their strategy for survival, but against unpredictable contingencies, they devise various tactics according to circumstances and flexibly correspond to survive. That is where the freedom of life stands. The world of life is such a non-deterministic one.

Suppose I start walking towards one direction. In terms of my will to walk there is the inevitable, but I have no idea what would be waiting to happen on my way. In this sense, I am at the mercy of pure contingency. However, I will continue to proceed, evading or removing the pressing obstacles or changing my directions. That is where the freedom of my will stands. The same goes for life forms.

Indeed, possible forms and directions a life form could take are full of contingency. Anything could happen to a life form. However, since the contingency includes the life form, it gives the life form freedom. Moreover, the very directivity of life to survive that lies behind the freedom, is the inevitable for life forms. In the fundamental flow of life, the contingency, the inevitable and the freedom are one. Within the freedom, the contingency and the inevitable are united as one.

This quality called freedom may be existent not only within life forms, but also within the origin of the universe. The universe has fluctuations because of its freedom, and because of the fluctuation, it organizes, gives order, and create itself.

The Flow of Life and the Principle of Formation

Life is propelled by the self-promoting ability that attempts to elevate the self to more sophisticated level. This ability is consistent through species, individuals and genes. This active characteristic is something that will be handed down permanently from gene to gene, an individual to individual and species to species. It is the function that is the fluidity and the formation – the force to go beyond the law of contradiction. That is to say, life does not stay forever in the world where, as the law of contradiction describes, "it is impossible for 'one' to be something that is not 'one'." Conversely, life is the force that tirelessly tries to make 'one' into something else. The formative force of life that constantly tries to change contains within itself the one and the many at the same time.

This formative force is the function to organize substances and to try constantly to change, but is also a function that, as Leibnitz indicated, does not have any expanse or form of its own, nor dividable into parts. [7] As an individual life form, each of us can sense this force deep inside our selves. We sense the fundamental flow of life at the base of our perception, decisions, will and emotions. This also leads us to our perception and understanding of lives of other life forms.

However, the formative force of life that is common in all kinds of life forms is a function that is not analyzable, graspable, nor even seeable.

The flow of life is like the flow of a river. Just as the flowing water never staying in one place, the flow of life also continuously changes. Just as the flow of river changing its direction of flow every time it hits obstacles in the riverbed or riverbank, the flow of life also changes its form every time it faces the ever-changing circumstances. The flow of life is driven by the single and permanent self-formative force, and when it hits the obstacle called 'environmental change', it discovers a wide variety of directivity to cope and allowing the flow to branch out. The diverse ways to cope is where the freedom and activeness of life exist. With such permanent self-formative force, the flow of life penetrates through the contingencies of the environment, and sustains its own existence forever. This is how the diverse sequences of life's evolution, from one to many, have been formed. Life is a pure activity that changes every moment. It is 'one' in terms of an activity, but it also contains 'many' in terms of it constantly changing. Life is 'one' that contains 'many'.

Life is a flow that transfers from species to species, an individual to individual, and from gene to gene. The flow of life does not know to which direction it is flowing. In that sense, it is solely unpredictable and non-deterministic flow. However, it also is the continuous flow that has been consistently attempting to create something. It is the limitless function that tries to organize substances, form individuals and compose species. Within it exists the infinite function to continue the survival. And yet this function will never be completed. Life is the infinite function that will never come to completion.

In life forms, even if the form of one individual seemed to be permanent, at the level of cells that compose it, there are never-ending replacing and growth, consumption and abandonment. The life activity has no rest. A life form is the change itself. Also, even if a form of a certain species seemed to be unchanged for a long time, the individuals that compose the species continuously will be born, grow, get old and die. The species itself also are formed and go extinct taking an enormous time, and by doing so supports the life as a totality.

Also, life forms are an open system that kept its fluid equilibrium state by letting in and out substances and energy from the exterior. The equilibrium state of life forms is nothing else but the equilibrium among the constant changes and fluidity. Life forms have possibility to change into any direction, and add to that, it concurrently has the instability of the direction of change being unpredictable. Therefore, life forms try to change while always keeping the fluid equilibrium. That is why life forms are capable of flexibly coping with the ever-changing external environment.

Life is the flow that changes every moment. All life forms do not end their lives in the same form they were born in, and never stop tireless changes. A single individual inseminates, multiplies, differentiates, grows, matures, degenerates, becomes decrepit and dies. All constituents within a body also are fluid. Cells that compose the human body also are constantly replaced, and humans also never stay the same even for a moment. One species also generates, disappears and changes over many generations. Life is the very fluidity that continuously tries to change into something different. Life is the permanent something within something that is always replacing and changing. Life exists in the world of formation.

Not only life forms but also the Earth and the universe are continuously changing and flowing without a rest. Everything changes and never stops, just like the flowing water. Everything changes every moment, and changing is the ordinary state. As Heraclitus stated, all things are in perpetual flux. Opposites will become one, as life becomes death and death becomes life. This world is the flow without a stop. Formation is the principle of the universe. Life forms are the expression of the ever-changing fluid universe itself.

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