Life and Earth: Philosophical Remedy for Environmental Problems

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1. Introduction

CONDITIONS for life to exist in the universe are limited, but gradual progress is being made by surveying the existence of extra-solar-planets. For example, the habitable zone for life in any galaxy is thought to be a conditional planet system which is ~25,000 light years or more away from the center of a galaxy, and which is centering on a fixed star of ~4–8 billion years in age. It has been suggested that the conditions for a suitable stellar system are, (1) the orbit of the planet is stable under a single star system, (2) the spectral type of the fixed star is similar to our sun's grade and the temperature is stable and moderate for billions of years, (3) liquid water can exist, (4) the luminous intensity of the fixed star is stable, and (5) the metal content is high in the fixed star. Furthermore, in order for the planet to be considered habitable it must, (1) be a terrestrial planet which consists of minerals and rock, (2) have a moderate planetary size, (3) have moderate distance and revolution eccentricity from a fixed star, and (5) have moderate rotation speed and inclination of the axis.

On the other hand, it is becoming clear that generating and the eventual evolution of life on Earth had a close relation to the state of the universe and the state of Earth's environment. The planet Earth had to overcome severe conditions for billions of years before the eventual habitation of life. Today, it is evident that the evolution of life on Earth was a coupled relationship with the physical evolution of the planet. The mutual evolution produced various living organisms and ecosystems which consist of a harmonious multiple-circulatory system of elements or matter, and eventually led to the formation of what should be called the "star of life". Human beings, who appeared last in the history of living organisms, are just now beginning to understand the true structure of substances, the structure and history of the planet Earth, the structure and history of life, and the origin and history of the universe through the rare thinking power and rare intellect amongst all living organisms. Further, human beings have created and progressed science and technology through the characterization of the present civilization, and have even made trips possible to space. However, despite this exceptional intellectual and technical ability, the human organism has, unfortunately, also destroyed the natural environment of the planet. This is the great paradox that humanity carries today.

As the natural environment or habitat of the human organism continues to be devastated, we must reflect, examine and analyze how humans view the current paradox. In this paper, we hope to examine what can be proposed from Buddhism towards the concept of "co-evolution of life and the planet Earth".

2. Relations of the Universe, Earth and Life

Every living organism on Earth consists of hydrogen, oxygen, and nitrogen as major elements in addition to carbon. In fact, these elements are ubiquitous elements found throughout the universe in what is referred to as "cosmic abundance". Since our Sun is a typical star in the universe, we can also assume that the composition of elements found in the Sun are representative of the cosmic abundance. When examining our Sun we find an overwhelmingly high concentration of hydrogen and helium, as well as oxygen, carbon, and nitrogen. Excluding inactive helium, these cosmic abundance elements are, as stated earlier, essential for life. In other words, the chemical elements essential for life to exist on Earth are abundant and extensive throughout the universe.

Based on this, is it possible to find life anywhere else in the universe? The area in which life can reside is defined as the Habitable Zone (HZ)[1] in a planetary system like our solar system, or inside of a galaxy.

(1) Galaxy Habitable Zone (GHZ)

The habitable zone within a galaxy is thought to be a planetary system, which is ~25,000 light years or more away from the center of the galaxy, and which is centered on a fixed star of an age of about ~4–8 billion years. Naturally, our solar system falls within this criteria. If too close to the center of a galaxy, the amount of substances, or concentration of universal elements will increase. Generally, a relatively big fixed star is formed during the early stages of a galaxy's formation. Explosions like supernovas may occur repeatedly and as a result, the heavy elements increase towards the center of the galaxy. In these condensed locations the life of a fixed star may be short, and therefore time for life to evolve may be limited. Moreover, since a newly formed fixed star is still relatively large, it will likely be of high temperature and the system may not be suitable for life. Further, radioactive explosions of supernovas show a high frequency near the center of the galaxies suggesting there are many factors dangerous for the evolution of life.

(2) A Suitable Sidereal System

The conditions for a suitable sidereal system are, 1) a single star system where the orbits of planets are stable, 2) a solar spectral type[2] within the range of F, G or K that has maintained moderate temperatures for billions of years, 3) water can exist as a liquid, 4) the luminous intensity is stable, and 5) the metal content is high.

1) Having a single star system means that the planetary orbits are stable. In any galaxy, a big energetic star tends to become a binary star system, and more than half of the fixed stars are estimated to be of the binary star system-types. In a binary star system, planetary orbits and temperatures are not stable, consequently, not suitable as a potential habitation zone for life. Since the orbit of a planet in the single star system is stable, it is more suitable for generating the potential evolution for life compared to a binary star system.

2) Solar spectral type relates to the temperature of the photosphere of a star and the stellar mass. When considering a habitable zone for life on a planet, a critical consideration is the temperature and stability of the stars temperature over time. Fundamentally, planetary temperature is correlated to the distance and temperature of the fixed star. In order to maintain similar surface temperatures to Earth, the planet should be located in a relatively distant position if the fixed star is large with high temperature, and similarly, the planet should be located in a relatively near position if the fixed star is small with low temperatures. Earth maintains an average surface temperature of about 15°C, while the history of the planet is ~4.6 billion years. This suggests that about 4.6 billion years is required in order for living organisms to evolve to higher animals like humans. An equally important fact is that the spectrum type of our sun is the G-class. In the case of brighter O, B, and A type stars, the life cycle of the star would only exist for another ~1 million to 1 billion years. Therefore, the spectral type[3] of the fixed star needs to fall within the middle grade of F, G, or K. It has been suggested that stars within the range of this spectral type make up ~5–10% of the fixed stars in our galaxy. Compared with these spectral types, the smaller and darker K or M type red dwarfs make up 70–90% in our galaxy. However, the possibility that life could exist and evolve around these stars is low

unless a planet is positioned relatively close where Earth-like temperatures could be maintained.

3) The existence of water in liquid form on the planet Earth is an indispensable condition for life and ecosystems of our planet. Incidentally, water exists in all three phases simultaneously in the form of liquid, solid (ice) and gas (atmosphere). The fact that water can exist in liquid form on a planetary scale on Earth is closely tied to condition 2), stated above. That is, the size of the fixed star (our sun) is a moderate spectral class and the planet exists in a relatively moderate position—too close to the sun and the water would evaporate; too far from the sun and water would turn to ice

4) Stability of the luminosity of the fixed star is also important. The fluctuation range of solar luminous intensity in our solar system is extremely stable falling within 0.1% during 11-year cycles. Thus, a fixed star with high luminous variability is probably not suitable. In our solar system a small glacial epoch during the medieval period may have been attributed to a rare reduction of luminosity of the Sun over a long period of time. This short instability of luminosity suggests that a slight change of the luminous intensity of the fixed star may have large consequences for the evolution of life.

5) The main elements which constitute a fixed stars ingredient are hydrogen and helium. On the other hand, the content of heavy elements (metals) can vary amongst different fixed stars. The formation of a planetary system around a fixed star is dependent upon the original metal content of the primitive solar system. If the metal content is limited, it becomes difficult to develop a planetary core for planets. We know today that the metal content of our sun is relatively higher compared to other well-rounded fixed stars.

(3) Habitable Planetary Requirements

The habitability of a planet also requires moderate considerations, 1) the planet is a terrestrial planet, 2) the planetary size is moderate, 3) the distance from a fixed star, 4) the eccentricity of orbit around the fixed star, 5) rotational speed, and 6) inclination of the axis.

1) Terrestrial planet means that the planet surface has the chemical qualities of minerals and metals where gravity is also moderate. Conversely, Jovian planets like Jupiter or Saturn are relatively big planets covered with thick layers of hydrogen or helium gas, and have stronger gravity. The common assumption is that these planets are not suitable for generating life because they do not have rocky surfaces, and the gravitational force is extreme. Therefore, in the case of larger planets, it

is thought that orbiting rocky-substrate satellites or moons such as Europa or Io of Jupiter, and Titan of Saturn have a higher possibility for generating life.

2) The size of a planet is directly related to surface conditions and gravity of the planet. For example, since Mars is relatively small, the gravity is also small. Since gravity is weak, atmosphere concentrations are limited. Therefore, even if Mars was located in the same position as Earth, the thin atmospheric layer would limit the heat insulation and greenhouse effect causing surface temperatures to be much lower than Earth. The thin atmosphere would also limit the synthesis of organic matter within the atmospheric layer and also allow harmful ultraviolet radiation, meteorites, etc. to penetrate to the surface of the planet. Further, the boiling point of water reduces, and the temperature range to which water liquefies narrows resulting in lower atmospheric pressure, further limiting the potential for life.

The planetary size also correlates to the quantity or concentration of planetesimal raw material. Sufficient internal heat might not be generated if the collision frequency of planetesimal material is lower such as on Mars. The lack of internally generated heat could also limit the amount of water vapor, snow or ice generated by degassing and cooling. Moreover, since containing heat at the time of formation is limited, it will likely become a relatively cold planet. The supply source of potential energy from volcanic activity, and thunder from cloud formation would also be scarce. Finally, the limited density and heat of the planet might restrict the melting of an iron-based planetary core that would subsequently weaken the magnetic field that prevents harmful solar ions from reaching the planet.

3) The distance of a planet from a fixed star is also a very important factor for a planet like Earth to evolve. Even if there was enough planetesimal material and the size was almost equal to that of Earth, like Venus, if the temperatures do not fall enough at the time of formation then limitations would occur. In the case of Venus, water vapor did not liquefy in a timely manner. Consequently, water vapor was gradually decomposed by ultraviolet radiation from the sun after some time, and eventually the water vapor photochemically altered to hydrogen and oxygen. The result was that hydrogen escaped to the outer atmosphere while oxygen was oxidized into rocks at the surface. If the cycle continues for more than a billion years, the water vapor will eventually be lost. The remaining carbon dioxide gas would account for the extreme atmospheric pressure of 90 atm (90 times our current atmospheric pressure). Due to the greenhouse effect of a carbon dioxide saturated atmosphere,

Venus maintains surface temperatures between ~450–500 degrees Celsius. Thus, if the distance from the fixed star is not specific, the planet will be unsuitable for generating life.

The conditions for the formation of oceans like that on Earth is also related to the temperatures that water vapor condense to liquid water. This condensation factor is also dependent on the distance from the sun. The ideal distance for condensation to occur from solar heating is estimated between 0.97–1.39 AU (Astronomical Units). Incidentally, the distance between the Sun and Earth is approximately 1.0 AU. Although Venus and Mars fall within the ideal range, the conditions on both planets remain quite severe. However, since this delicate equilibrium condition was fulfilled, the present Earth exists. The formation of a sea is also critical for reducing the concentration of carbon dioxide in the atmosphere. Consequently, the greenhouse effect on Earth was reasonable compared to Venus, and liquid water was maintained.

4) A moderate orbital eccentricity means that the planetary surface temperature does not fluctuate largely during a single revolution (one Earth year). For example, if a planets orbit has an elongated eccentricity, then it will have disadvantages for generating habitation of life because the sea might boil in the summer and freeze during the winter. The eccentricity of Earth is ~0.02 or less which is very close to a circular orbit. The eccentricity of most planet systems outside our solar system known to date is relatively larger with averages around ~0.25. Therefore, there may be just a few systems stable like our solar system.

5) Rotation speed of a planet governs the cycle between day and night. When the day and night cycle lasts in the hundreds of days or many years, the difference of temperature between day and night will vary dramatically. For example, the rotational speed of Venus is relatively slow at 243 Earth days. This extremely slow rotation causes temperatures on the surface of Venus to remain very high, as stated before. Under such conditions, more evolved animals may be unable to function properly due to lack of rest at night for hundreds of days. The brains of more evolved animals require sufficient rest during any given day.

6) In addition to rotational speed, inclination of the rotation axis is also important as it produces seasonal change. Seasonal change is lost when there is no inclination of the rotation axis. For more evolved organisms, seasonal change is indispensable for biogenic and reproductive activity as an environmental trigger. Further, inclination allows the difference of temperature between the poles and the equator to vary. When the inclination of a rotation axis nears 90 degrees, such as during the snowball Earth hypothesis[4], seasonal variability will be extreme.

This type of extreme inclination is detrimental to the continuity of ecosystems.

In summary, the narrow conditions for generating and evolving life in a galaxy, sidereal system and planetary system, are quite specific. If all of the above unique conditions are fulfilled, the possibility for life to occur will be high. However, the potential for these specific conditions to materialize are not as convenient as was once thought. Paleontologist, Peter Ward and astronomer, Donald Brown Lee (2000) concluded with "the rare earth hypothesis[5]". In their article they claim that the phenomenon for generation and evolution of life that happened on Earth is very rare in the universe. Although it was once thought that life might have existed on Mars or Venus, these possibilities in the solar system have slowly disappeared as planetary exploration progresses. Further, although about 500 planets have been discovered in other sidereal systems in recent years, many of the orbiting planets are considered to be of the Jovian class planets. Although, since there are at least 100 billion or more fixed stars in the Milky Way galaxy, there is still the potential for plentiful planets like Earth to exist.

In any case, these are facts based on the Earth's fulfillment of specific conditional criteria over the course of 4.6 billion years. In other words, these criteria are based on our planet and conditions we are familiar with. We must assume that there are other possibilities for life in variable conditions that simply do not exist on Earth.

3 Co-evolution of Life and Earth

Living organisms are strongly influenced by environmental parameters and have had to adapt accordingly to changing conditions. To this extent, living organisms have also contributed to the environment in positive ways, and consequently altered the environment through chemical cycles and climate feedback systems, or the "co-evolution of life and Earth[6]". In other words, while adapting to the surrounding environment living organisms have also influenced the environment by making it suitable for the future evolution of other living organisms. This feedback co-evolutionary process is not necessarily dependent on one particular organism, rather, involves multiple interconnected living organisms evolving in harmony.

Science has estimated that life arose on Earth about 3.8 billion years ago. According to the "theory of chemical evolution[7]", life arose on Earth after going through a complex process of chemical reactions. Another hypothesis called "panspermia[8]" suggests that life, or the building blocks for it originated in the universe, and that Earth was seeded by a primitive elemental-spore leading to the eventual evolution of life at some particular point in time. Both hypothesis', however, are difficult to verify and the only thing that is certain is the true origin of life on Earth is virtually unknown. In addition, there is still no clear explanation of the optical isomers of amino acid compounds that are the critically essential components of life on Earth. Amino acids are the essential building blocks of protein; even if all the possible amino acid compounds found in the universe were systematically fused, it would still be very difficult to mimic and calculate the quintessential proteins for life. At higher evolutionary levels, there are almost no explanations for the relationship between genes and protein compounds, and also for the formation of cells. For these reasons, there are some scientists who support the thesis that the universe simply has an unexplainable tendency to create life[9].

Although the origin of life is unknown, there is indeed life on Earth. With regards to the formation of primitive life, we know the existence, thus, potential for bacterium that obtain energy by oxidizing hydrogen sulfide from hot springs and hydrothermal vents from the seafloor beyond the reaches of natural sunlight. However, these sources of boiling water and vents tend to cool over time and are not permanent systems. By contrast, solar radiation can be obtained almost anywhere on the surface of Earth supplying enormous benefit for the extended maintenance of life. Photosynthesis, currently practiced by terrestrial and aquatic vegetation in general, is thought to have originated from cyanobacteria that appeared about 2.7 billion years ago. During this age, it is estimated that there was a major transformation and development in Earth's crust that led to the expansion of shallow coastal areas, creating favorable conditions for the proliferation of cyanobacteria. It has also been suggested that the transformation occurred during an increase in the strength of the magnetic field. Consequently, Earth became safer from highly energetic particle discharge interruptions from the universe promoting further reproduction of cyanobacteria. The combination of timely phenomena also led to an increase of oxygen in the atmosphere. In other words, the accumulation of free oxygen was provided by the co-evolution of living organisms together with the transformation of Earth's crust.

Eukaryotes, such as plankton, appeared about 2.0 to 2.2 billion years ago. Eukaryotic cells are generally 10 to 1000 times larger than cells of prokaryotes such as cyanobacteria. In eukaryotic cells, the genes are safely stored in the nucleus, and within the confines of the cell walls exists organelles that are functionally specialized such as the mitochondria, which performs oxygen respiration, and the chloroplasts, which coordinate photosynthesis. The emergence of eukaryotes may have been caused by the subtle increase of oxygen (~1%) in the atmosphere. However, due to its high reactivity oxygen is both harmful to living organisms as well as an effective energy source for respiratory systems. Thus, it is thought that eukaryotes symbiotically absorbed aerobic bacteria in the form of mitochondria to stabilize the reactivity and potential utilization for energy. Similarly, eukaryotes symbiotically utilized photosynthetic cyanobacteria in the form of chloroplasts to conduct photosynthesis. Thus, eukaryotic organisms like phytoplankton evolved as a result of endosymbiosis of prokaryotes in their cells, resulting in more active photosynthesis, which lead to more oxygen production into the atmosphere. In other words, the natural environment manipulated by living organisms allowed the potential for the future evolution of other living organisms.

The slow accumulation of free oxygen in the atmosphere allowed the eventual formation of a stable ozone layer. The ozone layer specifically absorbs harmful ultraviolet radiation that is extremely detrimental to living organisms. Since primitive plants and animals appeared 430 million and 380 million years ago, respectively, the ozone layer likely formed earlier at least 500 million years ago. Consequently, the environment became less hostile for life to survive on land safely, and for dramatically enhance biodiversity. This relationship between the adaptation of life and the environment (atmosphere; ozone layer) is a clear example of the "co-evolution of life and the earth", where living organisms extend the habitable range (or environment) for living organisms themselves, and allowed further biodiversity.

Carbon is known to be one of the most important elements for living organisms and also a highly influential element for temperatures of Earth. Although solar energy is the biggest factor governing the temperature of the earth, it has been estimated that the level of radiation was 70% of the current levels during the early period of Earth. According to this estimate, the surface temperature would have been lower than the present and the chemical composition would have also been different, freezing Earth. However, throughout the entire history of Earth, it has been suggested that the ocean never froze. This is likely due to the amount of carbon dioxide in the atmosphere being larger in the past, where the greenhouse effect functioned accordingly. Supposing the evolution of life took place quickly and photosynthesis occurred actively during the early period in Earth's formation, the amount of carbon dioxide in the atmosphere would have decreased quickly (through photosynthesis) subsequently allowing the planet to cool rapidly. If this were true, then life on Earth might suddenly encounter possible extinction or the termination of further evolution of life.

Evidence suggests that soon after the emergence of eukaryotes 1.9 billion years ago, there was active tectonic movement in the Earth's crust. The active divergence and convergence of plates on the surface of the planet transported fixed organic carbon to the subsurface layers of the crust, thereby indirectly reducing carbon dioxide concentrations from recycling into the atmosphere. Thus, soon after anomalous solar activity, the carbon dioxide concentration in the atmosphere was also reduced.

Consequently, this decrease of carbon dioxide in the atmosphere is considered one of the factors that prevented increases in surface temperatures on Earth above a certain level even after the intensification of solar activity. Based on this possible scenario, we can conclude that both the speed of evolution of living organisms and movement of the Earth's crust simultaneously influenced the carbon cycle, and consequently maintained the temperature of Earth to a certain degree.

Mentioned above are just a few examples and possibilities in the history of Earth. These examples suggest that the evolution of living organisms and the evolution of the planet Earth evolved synchronously and mutually. James Lovelock (1975)[10] advocated the Gaia hypothesis, or the "scientific biosphere hypothesis of Earth" suggesting that our planet system behaves much like a living entity. According to this hypothesis, life creates and maintains the overall environment and the planet Earth functions like a super-organism controlling homeostasis equilibrium of its own environment. Controversially, there are opinions that the Gaia hypothesis is not scientific[11] since Earth has historically not necessarily always acted conveniently for evolution of life. Still, when we observe certain relationships between life and the environment throughout Earth's history, the two appear to behave like a living organism at times. In other words, life and Earth's systems individually and as a unified system are arranged so conveniently and opportunely that the relationship can simply be described as a miracle.

4 Symbiosis from a Buddhist Perspective

Origin of life and co-evolution of life and the environment

In scientific terms, the homeostatic maintenance of animals is regulated by the central nervous system, or brain, while plants and unicellular organisms metabolize energy and other substances. All immaterial factors, or spiritual activity, are considered actions associated with brain functionality. Although the relationship between energy and substances are not satisfactorily sufficient in explaining all of the regulation and coordination of physiological aspects of life, science considers the relationship of energy and substances as a factor that maintains and integrates the life.

When considering life phenomena from the viewpoint of Buddhism, there are both material factors such as the physical body, and intangible factors such as "life-force" and information that guide and integrate the material factors. In other words, Buddhism recognizes that the phenomena of life has immaterial factors (life-force) that maintain and integrates life, as well as govern material functions such as metabolism. Buddhist principles describe immaterial activity as the "spiritual law (mind)" from the doctrine of "non-duality of body and mind" and the doctrine of the "theory of the 9-levels of consciousness and non-consciousness"; hereafter referred to as the doctrine of consciousness. In the case of the human body, the first five levels of consciousness are the functions of sensory organs (eyes, ears, nose, tongue and body) referred to as the "five minds". The function that integrates and judges the perceptions of these sensory organs is referred to as the "sixth consciousness", followed by the deeper layers of the "seventh consciousness" (awareness; Mano) and the "eighth consciousness" (Alaya-consciousness). Buddhism states that all life conserves these inherent hierarchy structures, and that life is primarily sustained by the eighth Alaya consciousness. All phenomina of life to the seventh consciousness are suspended by and based on the Alaya consciousness. The higher levels of consciousness (five minds) are integrally coupled to the material aspects, while the lower levels of consciousness secure the immaterial aspects. The material factors physically occupy a specific given space (living organism) while the immaterial factors are elusively more expansive. For example, while sustaining a physical presence or body of space, the eighth consciousness (Alaya-consciouness) can actually expand beyond the physical confinement to the size of the universe!

Incidentally, since the functions of the five consciousness relate to the sensory organs only occurring in higher animals, how is the concept defined in less evolved organisms? In the case of unicellular life and multicellular plant organisms that emerged during earlier periods in geological history, sensory organs which are part of the material aspects are still relatively semi-developed and consequently their functions are also undifferentiated (Kawada calls this "cellular consciousness")[12]. More evolved organisms, on the other hand, are capable of perceiving and sensing the outside environment through advanced sensory functions composed of cellular material. From the standpoint of "consciousness and non-consciousness", the consciousness aspects evolve from the individual cellular scale towards eventually more complex sensory organs, all the while this evolutionary process is primarily driven by the life-force processes of the non-conscious aspects. The cumulative result is that the non-consciousness aspects are eventually expressed in the form of highly evolved organisms, such as humans. When considering the eighth consciousness as the fundamental root consciousness, "life-force" after death remains latent in universal space. In Buddhist philosophy, when the conditions of material factors in a location (such as Earth) become appropriate, the eighth consciousness transcends on matter to create life.

Based on this philosophical concept, if there is a material basis (the existence of substances) to formulate life and if environmental conditions are appropriate for the evolution and survival of life, then life-generation is capable of occurring on Earth. This concept is also applicable to single prokaryotic cells that establish the preparatory material for higher-order organisms to materialize and manifest other life-oriented functions.

The relation between life and Earth (the environment) can also be examined from the Buddhist concept of the "non-duality of life and the environment" and the "doctrine of consciousness". The "non-duality of life and the environment" suggests that life and its environment are non-dual (not two) and maintain a relationship of inseparability. In one sense, they are inseparable because the entity of life is composed of materials from the environment. Nichiren describes this non-duality in the phrase "life is made up of the environment[13]". Another Buddhist concept that explains the relationship between life and the environment is the concept of Karma. Both life and the environment have "non-duality" Karma in Buddhism. In the eighth (Alaya) consciousness, all information relating to life and the environment is accumulated and stored in Karma. There are two types of Karma, "common Karma" and "non-common Karma". The non-common Karma accumulates all peculiar information of an individual life, which relates to experiences (not just those experienced, but also the entire genealogy of its existence). The non-common Karma makes up the fundamental base and life-force information of a single life, and presents itself accordingly unrelated to genetic information.

On the other hand, common Karma refers to the related Karma that particular groups of life together share in common. Here, particular groups can be defined as, for example, species, genus, family, order, class, etc. in accordance with the biological classification system, or can be groupings based on ecosystems such as coral-reefs, tropical rain-forests, coastal areas, watersheds, forests, etc. From this perspective, the human species, which appears in the final stages of biological evolution, embodies all of the common Karma of living organisms. Thus, in Buddhism the environment is the manifestation of all the common Karma, and the common Karma in turn formulates the environment. Therefore, the concept of the eighth consciousness is not restricted to just the living world, but encompasses the entire physical environment and expands throughout the entire universe.

By examining the co-evolution of life and Earth from Buddhist viewpoints through the "non-duality of life and the environment" and the "doctrine of consciousness", we arrive to the following conclusions. As described earlier, since the world of life and the physical world are interconnected, the eighth consciousness accumulates the information experienced by life and its environment. This compiled information is integrated within the eighth consciousness, and while the portion of the non-common Karma creates new individual life, the portion of the common Karma modifies and creates new environments. Consequently, life and Earth (the environment) develop in a complex simultaneity with mutual influence. In other words, while science describes and explains material matter and substance principles, Buddhism describes and explains the life-force principles of how life evolves, expressing itself from materials and substances, symbiotically with the environment.

Medicine for Earth and the role of Buddhism

In ancient Indian philosophy, everything is composed of the four elements of earth, water, fire and wind. From the perspective of the human living organism, the earth signifies the body, water signifies blood, fire signifies temperature and wind signifies breath. In Buddhist medicine, the four elements are associated to the mind, the circulatory system, endocrine system, and the immunity system where disease is the result of an imbalance between these four elements. Therefore, treatment in traditional Buddhist medicine focuses on balancing the states of mind, circulation, endocrine and immunity that are maintained by the three factors of health: nutrition, hygiene and sleep (stability). James Lovelock (1989)[14] also argues a need for a physiological cure or medical remedy for Earth based on the Gaia hypothesis. The analogy of physiology or medicine for Earth is a good characterization for resolving environmental issues. All too often we focus on practical or technological methodologies to resolve the slow demise of the planet. Thus, it is critical to consider maintaining the health of Earth through the prescription of Buddhist medicine.

In Buddhist medicine, the factors that maintain health—nutrition, hygiene and sleep or stability—correspond to the circulating (cycle) systems of elements and materials, bio-diversity and relationships of coexistence, and overall ecosystem stability of Earth. Since nutrition in life refers to the steady source of nutrients and energy, it is similarly important to maintain stable circulation of elements and materials in the case of Earth. If chemical matter does not properly circulate throughout the hydrosphere, atmosphere, geosphere or biosphere, then stagnation will occur. Proper maintenance of hygiene protects the body against disease-causing organisms. Simultaneously, living organisms maintain a co-existence and symbiosis with microbes and bacteria. In the case of the planet Earth, biodiversity and symbiotic relationships maintain planetary hygiene for the planet. Moreover, as all living organisms require stability and balance acquired from rest, the planet Earth also depends upon stability and balance of various parameters. From the perspective of Buddhist medicine, the proper maintenance of these three factors ensures the healthy functioning of the mind, the bloodstream, the endocrine system and the immunity system. In an expanded interpretation of this concept, we can find the following meanings. The mind, in humans, maintains the harmony of physical and spiritual functions, which on Earth is equivalent to maintaining the harmony of ecosystems that includes living organisms and the environment. The bloodstream refers to smooth circulation of elements and materials, while the endocrine system maintains the balance between metabolism and growth, which on Earth is equivalent to maintaining the balance between ecosystems and the evolution of living organisms and the environment. The immunity system functions to protect the body against the external enemies, which is equivalent to the maintenance of biodiversity and harmonious coexistence. As mentioned above, Buddhism explains that the driving force of life itself is the promotion and generation of abundant life and the harmonious relation in the evolution of living organisms and the environment. On the basis of the principles of life in Buddhism, the conditions that enable the co-evolution of living organisms and the environment are dependent on the stability between the circulation of elements and materials, biodiversity and the relationship of coexistence, and ecosystem stability.

In the field of medicine, mutual cooperation by supplementing the advantages between Eastern and Western medicine is vital for general success in treatment. We can also say that it is equally important for mutual cooperation between science and technology, and philosophy and religion to ensure the healthy state of the planet Earth. One of the contributions that Buddhist philosophy can offer to the solution of environmental issues is to provide parameters to assess whether life or biosphere and the planet are maintained in satisfactory cohesion. Based on the Buddhist life principle, Buddhism can offer indices and parameters that are based on the three factors of the circulatory system of substances, the coexistence and symbiosis of biodiversity and ecosystem stability.

5. Conclusions

T. Matsui (1989)[15] points out that human civilization is a paradox. The requirements of high food production to sustain the excessive population increases have pushed the capacity limits of nature, where for example, desertification in the past has caused the extinction of ancient civilizations. This configuration closely resembles the example of the current industrialized world that is causing increases of carbon dioxide into the atmosphere and destruction of the ozone layer by Freon gas. The "paradox of civilization" was once a matter restricted to particular periods in time and specific regions. However, the "paradox of civilization" in the present day is a problem that spans the entire planet and endangers the existence of mankind on longer time spans. Likewise, Dr. Ronaldo Mourão[16] also points out the "paradox of civilization" in saying, "While animals that cannot think instinctively preserve diversity and the environment, human beings who can think and have intelligence are the biggest decimators of the environment and biodiversity which ultimately should maintain the way of living for human civilization". Human intelligence and the ability to think are distinguishable factors that have allowed human civilization to advance to richer and more comforting living, but in reality, we have submitted to the paradox of destroying our own habitat and the planet itself. This paradox appears to look like we are creating something new and advancing cures for diseases on the one hand, while on the other hand we are destroying and generating new diseases and problems. In simpler terms, the current situation is a ridiculous paradox of human civilization appearing to advance medically and technologically, yet all the while we are destroying the human-heart and environment at an unprecedented rate and scale—human civilization and Earth are in dire need of a remedy. Barry Commoner (1972) says[17] that we must recognize the third law of ecology that "nature knows itself best". Moreover, Dr. Mourão also warns[18] that, "the diversity of our planet must be maintained by some natural law which is invisible to our eyes". In the present and future, it will be increasingly important for the human civilization to continue to support measures to resolve environmental problems, but also recognize other forms of sustainability outside of simple stopgap measures. The conclusion of this article is that sustainability should be based on the Principles of Life from Buddhism, where the support of biodiversity and symbiosis stands as the primary pillar and driving force for the promotion of the harmonious development between life and the planet Earth.

Notes

[1] G. Gonzales, D. Brownlee and P.D. Ward (2001), Refuges for Life in a Hostile Universe, Scientific American, p. 62–67.

[2] The relation between the spectral types and the surface temperature of fixed stars is following; O type: 29,000–60,000K, B type: 10,000–29,000K, A type: 7,500–10,000K, F type: 6,000–7,500K, G type: 5,300–6,000K, K type: 3,900–5,300K, M type: 2,500–3,900K.

[3] See note 2.

[4] Salyards, S. L., K. E. Sieh, and J. L. Kirschvink (1992), Paleomagnetic Measurement of Nonbrittle Coseismic Deformation Across the San Andreas Fault at Pallett Creek, J. Geophys. Res., 97(B9), 12, 457–12, 470.

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