

Civilization as a complex system

This is an interpretation of human civilization as a self-organizing system which develops itself through mutual interactions. Civilizations run by humans on the earth have experienced sudden cultural leaps and divisions time and again. Understanding this phenomenon requires to view them as self-organizing systems or complex systems, where the determinist law doesn't always work, and dominating forces are chiefly coincidence and non-conclusiveness. Referencing to other scholar's theories such as Arnold J Toynbee's *Contacts of Civilizations*, I try to deepen the logical observation on the leap and division of civilization from the perspective of the comparative study of civilizations.

Self-formation through mutual interactions

In the chapter about the Contacts between Civilizations theory, and especially in the Contacts between Civilizations in Space theory in his *A Study of History*, Toynbee described a phenomenon that in the process of a powerful civilization expanding and absorbing other weaker civilizations, the inferiors show both submissive and disobedient responses, and the antagonistic responses becomes a source of new creations. He found this phenomenon in the cultural expansions in ancient Greek and Europe, and compared these two examples in details.

Certainly, interactions with other civilizations give a crucial impact to a civilization. Just as we experience in our own life, an encounter with something unknown could cause a huge change to either side. This encounter is so powerful as to create a new civilization, to kill one, to make one to reborn and to force

transformation. A new civilization is created in a contacting and assimilating process among multiple civilizations. However, it is not necessarily correct to assume the condition where already established civilizations have existed in the first place, and they eventually make contact to be related, just as we saw in the cultural exchanges between the East and the West. We would rather need to assume that it is because they encounter that civilizations can develop and establish themselves. Toynbee's theories are based on the assumption that civilizations were already there, on which he built his thoughts about the contacts between superior civilizations and inferior ones. But, given the fact that weaker civilizations often achieve independence by improving their efficiency as a result of encountering with superior ones, it may be sensible to focus more on the encounter rather than civilization itself.

In other words, civilization changes its quality through communicating with others. Communication enables a civilization to form, not the other way around. Civilization transforms itself by contacting, interfering and stimulating each other. The human history was developed on communications among civilizations.

Civilization forms itself through mutual communications. All interactions involve self-formations, and self-formations always involve interactions. There are many different forms in cultural interaction such as trading, diplomacy and war, through which humans, goods, information and technology circulate. Civilization keeps changing its quality like liquid, getting stimulated by other civilizations, exchanging each other contents like people, goods and information. Therefore, "self-formation through mutual interactions" or "mutuality" is the essence of civilization.

"Mutual stimulation", "inversion", "absorption" and "merger" are aspects of numerous cultural interactions. "Mutual stimulation" is a communication taking place while characteristics of either side maintained. The interaction between the Chinese Han dynasty and the Roman Empire would be the best example.

"Inversion" is the case when a small civilization becomes powerful and independent, under influence from bigger civilizations to which it first complied. Examples of this are found in the conflicts among civilizations around the

Mediterranean Sea. "Absorption" is a situation where a powerful civilization swallows up inferior ones. Toynbee's much dedicated observations about the cultural expansion in ancient Greece, Rome and the Western civilization, are representations of this type. Tough, in many cases, inferior civilizations leave big impacts on the superior that absorbs them. "Merger" is a state where multiple civilizations get mixed up to become one large civilization. The Chinese Chang Jiang civilization, the Yellow River civilization, the Liao civilization and the Sanxingdui civilization, are examples for this type. Here, small civilizations first only communicating externally, gradually start merging and eventually become an internal part of each other.

Whatever form of interaction they take, civilizations collide, antagonize, complicate, contact and move, acting and counteracting endlessly, affecting and changing each other. The side that affected, for the very action, gets affected by the other side and have no choice but to go through a change. Given this, the core of the process of civilization's change must be not in the civilization itself but in the mutual actions between civilizations. Civilization doesn't induce interaction, it is interaction that creates civilization.

Saying this focusing on what happens to one civilization, it contacts with other civilization, learn characters of it, change the quality of itself and transform. Civilizations make continuous changes by accepting foreign cultures. Without fluxes of foreigners, civilizations cannot exist. Trading, exchanges of envoys, students and travelers, influx of migrants and refuges, other nation's invasion; such things deliver directly new documents, information and culture to civilizations, driving transformation.

Even a small piece of cultural element of one civilization could have an impact to changes the entire quality of other civilization. Once new culture is accepted, it is inevitably followed by others. Such foreign aspects as culture and custom, technology, thoughts and institutions create a diversity in the existence culture. As a result, the existing systems of economy, society, politics would be dramatically changed. For example, the introduction of iron tools is known to have induced a massive transformation in human life. It improved efficiency in

farming, increasing agricultural productions, and in construction works including forestry and water control. It also sophisticated weapons. people's life style largely changed. War occurred more frequently, and eventually nation states were born. In Japan, the flow of foreign cultures over the history, from iron tools, rice farming, Buddhism to firearms, changed the country greatly. The Western civilization was heavily influenced by the Arabic culture including paper making, printing, gun powder and compass for navigation. Any civilizations form and develop themselves by accepting foreign culture.

That means that the creativity of a civilization is defined by how it was combined with other cultures. All of civilizations produce something new through accepting numerous information and goods, combining them in their unique ways to integrate. How foreign materials are integrated is the key for civilizations to develop its creativity.

None of civilization does develop on its own. Civilizations form themselves not with their own inner spontaneity but with a contact with other civilization. Of course, spontaneous development has a role in the formation process of civilizations but there are more significant elements to it.

Cooperative self-development is the general formula for civilizational development. Of course, each civilization has different history in terms of the process of development. Some of them have formed more by itself, while others by communicating. However, more or less, they must have come through both processes. Even the ancient civilizations of the New World, which is generally thought to have built cut off any other civilizations, actually had interactions. For example, the Mesoamerican civilization was connected with the Andes, and there are evidences of cultural communication between continents over the Atlantic Ocean and the Pacific Ocean. In this respect, there must not be such thing as pure parallel evolution or self-transformation. When looking isolated, unique cultures exist in different regions, often they are connected in some ways. Vertical developments of culture have in many cases parallel developments involved. Civilizations develop interacting with others, and none of them are totally isolated. Civilization is something that forms through mutual interactions, and it

is a process of a relation-induced transformation.

Civilization as a self-organizing system

Civilizations are self-organizing systems.

It is rather a notion common in the field of natural science that in open systems, high-level of orders are spontaneously produced. Open systems which circulate substances and energy of surrounding environment, when it is in a non-balanced condition, will begin to rearrange the order to a higher level.

Furthermore, the order will be bigger than the amount of element that constitute the system. Civilizations are externally-opened and non-balanced self-organizing systems. Indeed, civilizations are never stable, continuously shifting of its quality by elements such as people, goods, money, information, technologies and so on.

But it is this unstable condition that produce new orders and forms.

Inside of self-organizing system is always fluctuations occurring. In many cases those fluctuations are caused by documents and goods brought from outside.

When the fluctuation grows over a certain level, a civilization begins to reform itself toward a new order. One example is the process of a new technology brought in prompting innovations and eventually changing entire society.

In non-parallel open systems and self-organizing systems, the amount of entropy will decrease. There, the degree of chaos is reduced, and in turn, new orders and forms are produced. Human's efforts to develop civilizations are also attempts to counter the physical law of entropy enhancement. In civilizations, cities are formed, tall buildings are built, population is amassed, trading networks are set, nations are established, new social orders are defined.

This type of order comes with divisions and hierarchies. As a civilization develops, the handicraft industry and trading separated off from agriculture, specialization of each occupation deepened, and social division is established. At the same time, with the emerge of social class system in which people are separated into producers, soldiers, governors and religious conductors, prompting

the formation of social order, further complicating the civilization. Civilizations are dominated to an inclination to develop from simplicity to complexity. Our civilizations have been evolved from chaos to order, which is a process of complication.

Civilizations are integrating forces that produce uniformed style of life, integrating multiple elements. It takes only some integrating forces for civilizations to be born. How they are integrated, arranged, edited will define the form and character of the civilization.

Religions have an important role in this. Religions have a power to integrate things into a civilization. Invisible religious forces create a visible civilization. Many of ancient cities were developed around religious structures. A religious building that was first built became the symbol of community around which politics, economy, and social activities were run. Managements of commerce, water and mountains control, and trading were also conducted there. These activities gave birth to numerous social categories of people, including clerics, bureaucrats, soldiers, craftsmen, who didn't engage in agricultural work, to form a city. In this case, the accumulation of surplus agricultural products is not the direct cause of the emerge of religious monument. It is rather that a religious building was built first, which promoted cooperate work in agriculture, increasing production capability, resulting in a production surplus. The evidence of this is found at the ruin of Kotosh in Peru. Furthermore, at the Göbekli Tepe archeological site in the southeastern part of Turkey, there is a 11,600 years old shrine surrounded by stone columns with reliefs, where people of the hunting-and-gathering age visited for pilgrimage from afar. It is a convincing proof of that a religion gave birth to a civilization and not vice versa.

Throughout the human history, religions have played a big role in civilization's birth, growth and life. It is not the case only for establishing ancient civilizations. As seen in China, Korea and Japan, the introduction of the Mahayana Buddhism led the existing civilizations to take a new form as new temples were constructed, the number of Buddhist monks grew, the stability of those nations increased. In the Islam sphere, the religion helped flourish the civilization by securing social

order and economic principles, and contributed to establish its broad and active commercial zone.

Leaps of civilization

In self-organizing system, a phenomenon so called phase transition is observed, where the system rapidly starts rearranging its organization, when it hits a certain critical point. Human history has experienced such turning points several times over the time. Shuntaro Ito argued that human history has had five significant turning points in his “civilization’s five phased development” theory. Here, what he was arguing about was phase transitions that happened in self-organizing system. According to his theory, to achieve the current world state, humans have come through five phases of revolutions; human revolution, agricultural revolution, city revolution, mind revolution and science revolution. Recently he has added environmental revolution to this list. These revolutionary leaps of civilization were the phasal transitions and creative evolutions of human history, or what Henri-Louis Bergson called “Élan vital (vital forces).

The first leap, the human revolution, occurred during the Old Stone Age, during which hunting-gathering economy was run, the used of stone and bone tools started, the use of fire became common, and people come to have the notion of families. Also, language, funeral and cave art began to be seen in this period. It was the first leap of humanity.

The second leap was the agricultural revolution, which corresponds to the Neolithic period when such activities started as discovery of farming and farming skills, and domestication of animals, and the invention of ground stone tools and clay pot making.

The most notable aspect in these two early revolutions is that the formation of civilization was made mostly through interactions with the surrounding nature. Human activities are restricted by natural environment. However, whenever humans were at odd with the nature, they always vigorously invented new

technologies so as to reform the environment and overcome the condition. It should not be missed that both the human revolution and the agricultural revolution, and other ones that followed were in a way human's counterreactions against challenges put by nature. Certainly, natural environment itself has been reformed and rearranged over years through this. The leaps of civilization were creative evolutions and results of human's tireless fight against the surrounding nature. Civilization is restricted by environment around it as well as restricting it. A new form of civilization is born from the interaction between civilization and environment. Civilization is an open, self-organizing system that develops itself in relation with environment, exchanging energy and substances with its surroundings.

The city revolution came third. Corresponding roughly with the Bronze age, it is represented by early civilizations including the Mesopotamian, the Egypt, the Indus, and cities in ancient China and the New World. Major characters of this period include huge religious shrines, formation of bigger communities and hierarchy systems, intensive agriculture that resulted in production surplus, development of handicrafts and trade, division of labor, the birth of organized religions, logical science and local arts, and establishment of monarchy and nation states. It was a remarkable period in terms of human development.

However, to make this much of leap of civilization, humans must have needed more than merely achieving agricultural production surplus, which was enabled by acquiring the knowledge of intensive farming. What was necessary to make it possible was markets where productions were traded. In other words, even if the land was not for farming, it could be made a market by improving a connection to other lands. Some cities were formed in this way.

Also, cities made close networks each other through trading, diplomacy and warfare. What we call the four great civilizations were also based on close connections multiple cities. Furthermore, these four civilizations are known for having connected each other as well, not established individually and stood alone. Even the New World is considered to have had communicated with older civilizations in other continents.

Civilization is not a static existence but a self-organizing system that develops in parallel with other civilizations by interfering each other. In a self-organizing system, which is in a state of non-equilibrium with substances and energy that are flowing in all the time, when some conditions come to a certain critical point, it rapidly starts producing new order, like a single-celled organism transform to a multi-celled organism. The Establishment of city civilizations were also a leap of a self-organizing system of civilization.

The fourth revolution, the mind revolution, was a huge change of human mind that occurred in Greece, India, China, and Siria almost simultaneously. This revolution was attributed to extraordinary individuals and their thoughts such as Socrates, Buddha, Confucius, and prophets in Israel. They sought for a fundamental relationship between humans and the world, and broke the then widely perceived myth and magic based world view. Their thoughts remain today as religion and philosophy. It is considered that behind this revolution of human mind were the maturity of city civilization, rush of establishment of city states, the spread of iron tools that dramatically changed people's life, prevalence of rationalism and the principle of male-centric society that were brought by nomads. After this revolution, some of the ancient great empires were established based on the religions and philosophies from this period. The huge change that happened in human mind was also a huge advance for the history of human civilization.

The science revolution caused a great change to the scientific world view in the 17th century Europe. It was an attitude to grasp the truth of the nature by mathematical laws by converting qualitative aspect of nature into measurable quantity and to prove it through experiments. The modern natural science born in the West had a totally different attitude towards the nature from the Aristotle's natural science that the Europe had been following. Behind the scientific revolution was the technological character of the West, which is very different from the philosophical nature of ancient Greece. The fact that the West achieved the industrial revolution later by adopting technologies shows this difference clearer. This industrial civilization made possible by the industrial

revolution prevailed across the globe and formulated the structure of modern world. This, too, was certainly a great advancement of human history.

Before analyzing the science revolution, it is necessary to overview the commercial revolution in Eurasia. During the 11th to the 12th century, in the Song dynasty, China, the craft manufacturing flourished. After Muslim merchants brought this to Europe, it became a popular trade goods. It was also through this route in Eurasia by the hand of Muslim merchants that the Western people adopted the Song inventions such as gunpowder, sailing compass and printing technique, as well as the Islamic science. Although based on different perspective on science, the commercial revolution in the medieval time certainly paved way for the 17th century European scientific revolution. If it really worked this way, we need to take into account a medieval science revolution that accompanied the commercial revolutions in China and the Islamic regions as a presumption for the Western science revolution.

Overviewing the significant leaps in human history reveals horizontal relationships between civilizations as well as vertical emerge. Indeed, these cultural revolutions didn't happen simultaneously across the globe but did first in a few advanced regions that adopted it, and spread to other regions through various networks, forcing changes to local civilizations. On the other hand, there are cases where horizontal relationship between civilizations produced revolutionary changes. One example is the mind revolution prompted by the introduction of iron tools and a logical thinking by nomadic people who moved around a wide range. The Western science revolution happened in the same context with the backdrop of development of trade across Eurasia. Even in the early stages, establishing and growing of the cities in the Indus region, Egypt, ancient China, were related to the connection with the Mesopotamia. Meso-America civilization is also considered to have achieved its establishment under influence from other continents. Civilization is a self-organizing system that develop itself through mutual interactions. Civilizational leap also comes from this interaction.

Branching out of civilization

In civilization's phase transition process, at a certain critical point, a creation of new order begins. But the form of outcome is not defined. In other words, the creation has a freedom of deciding its own formation. Furthermore, when a newly generated culture spreads to other regions, it could change its form in accordance with the various cultural conditions of the places it is brought to. Because civilization can take any form in relation to substantial patterns and arrangements of elements, whether it is a spontaneous evolution or the one inflicted by external stimulus, the development of civilization can be various in form and process. Thus, civilization branches out and diversifies with its own characters like a tree.

If so, it would be impossible to generalize the steps of development of the world history and formulate into a universal law. Hegel who regarded the world history as the process of development of freedom of human mind, divided it by degree of freedom: Orient level, Greco-Roman level, German level, and his own time in Europe which he placed at the highest level. Meanwhile, Karl Marx saw human history as a growing contradiction between production capability and production environment and reversed the idea of Hegel. He divided it into the Asian dictatorship, the ancient slavery, the medieval feudal system, and the modern capitalism. However, such attempts to explain developing process of human history in a single perspective are inevitably bound to the Western-oriented world view and are not necessarily relevant for all civilizations. The actual history of human civilization has made progress by splitting into many branches.

Civilization's multilinear evolution is a theory focusing on this point, whose advocates include Marshall David Sahlins and Elman Rogers Service, Julian Haynes Steward, Yasusuke Murakami. This theory focuses on individual development of regional cultures and its propagation to introduce civilization with multiple sources of influence in growing. Indeed, even in a spontaneous change within a framework of civilization, there are countless elements working

together, an outcome of change, or the form that civilization will take, could be various. Furthermore, considering changes induced by interactions with other civilization, with local differences in condition, the selection of possible outcome would be even more diverse. Therefore, the view that human civilization branches out into many different ways in the course of development, seems an accurate description.

In this respect, we should take the theory of “civilization’s five phased development” not just as a law in which a civilization develops individually following certain steps, but it is explaining more diversified aspects. Whatever stage it might be; human, agriculture, city, mind, science, revolution always occurs in different regions in different forms, spreading outside and assuming further different forms according to the conditions of the place it has been brought to. Needless to say, how each revolution looks totally different region by region, particularly that of agriculture, city, mind. The human revolution occurred technically only once in Africa, However, it doesn’t mean that that was a phenomenon of one specific region in Africa. It could have been a collective movement that occurred in many regions in many different ways. Also, we shouldn’t ignore the impact the revolution had to surrounding regions. The science revolution, too, has many reasons to be considered as being multilinear, seeing the case of the modern period Europe, which had the Islamic and Chinese science revolutions as a source and the consequent spreading to other part of the world.

When it comes the spreading of civilization, nomad people in Eurasia played a vital role as a medium. The agricultural revolution includes the invention of animal farming. The nomads who were mostly livestock farmers and active across Eurasia around from 2,000 BC to the 13th AD, repeatedly invaded cities based on plantation agriculture. They gave numerous cultural influences to local cities and their later development, contributing for civilizations to diverse. These nomads worked to prompt cultural interactions among civilizations, thus enabling multiple unique civilizations generate in Eurasia. The same function as these nomads was played also by traders and maritime people.

Contingency and non-determinativeness

Whether civilizations generate by themselves or being brought from outside, they are composed with an arrangement of various elements, what shape they will take is defined by the combination of consisting elements. The shape that a civilization can take is dominated by contingency and improvisation, and somewhat accidental.

Generally speaking, how history develops depends almost entirely on chances. By such unexpected events as a sudden appearance of a heroic figure who has both leadership, aggressiveness, a making of audacious inventions by someone unknown, or an attack by enemies or natural disaster, the human history has been greatly changed. If we didn't have such geniuses as Alexander the great, Mohamet, or Genghis Khan, our history would have taken a very different path. Also, without discovery of cultivated plants, invention of iron tools, horse riding technique, and machine production, which all happened by chance somewhere on earth, we would have seen neither agricultural revolution, mind revolution, nor industrial revolution. Prosperous civilizations in Meso-America and in the Andes were ruined all the sudden by unexpected attacks by Western countries. Considering these examples, Rises and falls of civilizations seem to be happening simply by chance. Here, there can't be any necessary laws.

All civilizations are connected each other and co-working, and all decisions are made within this relationship. Therefore, what happened to a civilization, like people's life, cannot be reproduced nor reversed, and it is full of contingency and non-determinativeness. History cannot be reversed, reproduced or foreseen. There is no way to predict the future precisely in the historical world, which is based on mutual relationship. Searching for laws in history is useless. This is where the freedom of history is found.

In the long human history, there were civilizations such as ones in the Meso-America and the Andes came to a sudden end at the height of their prosperity

due to invasions by foreign enemies. Also, there were civilizations like the Chinese since the Sui and the Tang dynasties, which was once dying but reenergized by an influx of a new religion. Civilization can either die and be reborn by encountering with other civilizations.

This perception deters uniformed historical laws including the phased development theories argued by Hegel and Marx, and the arguments by Spengler and Toynbee that civilizations have regular parallel relationships. Encounter of civilization could defy Toynbee's theory of self-directive civilizational development. In fact, Toynbee maintained both perspectives in his theories on civilization. However, the encounter theory contradicts the self-development theory. Some civilizations collapsed either by themselves or by impacts from outside, while others survived like in China and India. What decides the course of life and death of civilization is encounter of civilization. Development doesn't always take a straight path like that of the Greek and Roman civilizations which can be clearly divided into the course of generation, growth, collapse, dissolution, disappearance.

Civilization as a complex system

A self-organizing system, also called as a complex system, is an active entity that produces new organization through interactions among numerous elements. In the system, new characters forms and more complex structures and functions are spontaneously formulated. Because the new structures produced by interacting elements are more complex than those existed before, the process is described as "emergence". A phenomenon called phase transition in which a fluctuation in the system rapidly produces a new organization when it comes to a certain point. For the total volume of what is produced in the emergence is bigger than that of what constitutes the system itself, the outcome can't be explained by breaking it down and comparing with original elements.

Civilization is a complex system that produces new organizations through

relentlessly relating with other civilizations. There is no civilization that was born from other than relations among civilizations. It is mutual actions that enables them to develop each other. When civilizations act mutually, new forms and more complex structures emerge. They keep reorganizing themselves by interacting each other, exchanging goods, people, money, information, and technologies. Civilization is a complex system as well as a self-organizing system that continuously creates new organizations through physical interactions.

Humans, throughout its long civilization process, have produced so many things such as stone tools, farming skills, cities, large structures, arts, languages and letters, laws, nations, sophisticated religions and philosophies, numerous scientific knowledges, markets, industries, and so on. These revolutionary changes are the phase transition of civilization. Civilization evolves to ones with more complex functions by keep adding more advanced structures to the original. The complication process is nothing but a diversification of relationships by means of hierarchization and division. In fact, human civilization has been evolved from simplicity to complication, developing hierarchy system and dividing labor through transforming their society from hunting and gathering life style to agriculture-based society, to urban society, to modern industrial society. It was to increase its adaptation ability to the environment that civilizations underwent complication of its structures and functions. Civilization adopts itself to the ever-changing environmental conditions by relentlessly rearranging its internal structures and functions and organizations and institutions.

The system that has an ability to create new organizations responding the environment is called complex adaptive system. It can invoke emergences of new forms and structures in response to environmental changes. When it is in the middle of chaos and order, the system actively produces new organizations to adopt it. This evolution works at maximum in the area called *the edge of chaos*, where chaos and order cross. When a complex adoptive system is at the edge of chaos, it changes its condition from chaos to order and order to chaos, moving continuously between collapse and reformation.

Human civilization is also one of the forms of complex adaptive system. When

at the edge of chaos, civilization changes its organization repeating emergence and disposal as well. Civilization sometimes collapses in chaotic confusion but can produce new order to reborn again from that state. Civilization has evolved in the repeating death and rebirth. If a chaos is too deep for a civilization to start reorganizing process, the civilization would cease to exist. On the other hand, if the order of a civilization is too rigid, the civilization would lose its adaptability like a fossil. Civilization is an entity that actively changes itself to evolve in the middle of chaos and order.

It is because complex adoptive system is composed with relations of numerous elements inside and outside of the system that it can produce emergences of new order in the edge of chaos. In the world of relations, one thing is linked to everything and everything can be found in one thing, so making one decision requires to take into account the effect it has to everything. In this world, many is in one, and all is in a part.

The world of civilization is based on relations among civilizations, too. For civilizations are connected and influenced each other both in time and space, a civilization cannot be cut away from other civilizations. One civilization flows into other civilizations and one civilization has traits of many other civilizations. In fact, every civilization establishes its rich and colorful formation by the influx of foreign civilizations. This is why a civilization need to be observed in the relationship with other civilizations.

A complex adoptive system based on relationships of elements has a network structure where things are connected each other. Through this network, each element affects others towards organizing new formation. The denser the network is, the faster the speed of new formation to be produced.

The world of civilization is based on mutual relations between civilizations, forming networks of mutual influence. They are connected through this network, changing its forms relentlessly in the cycle of emergence and collapse of order. The order of civilization is created by this network. It is because civilizations are networked that they make progress closely relating each other. The reason why < medium civilization > is needed to be assumed at the junction of civilization

networks as a media that forms the networks themselves is that that is what enables civilizations to mutually interact and change.

It is because human civilization is a complex adoptive system that small accidents and trifle inventions or discoveries that occurred at the corner of the world sometimes cause a fundamental change to civilization as they get multiplied in civilization's mutual relation networks. In a complex adoptive system, it commonly happens that a tiny fluctuation that occurs when the system is still immature multiplies synergistically and eventually has an unexpectedly great impact on the entire system. This sensitive dependence to the initial condition is derived from the fact that complex adoptive system is also a non-linearly system in which various elements are co-working. Civilization is a non-linearly system as well. This is the reason why in civilizations such patterns are observed that a small happening eventually turns back to invoke a change. In this type of self-referential cycle, cause and effect are connected in circle, and the effect always comes back to the cause, continuously making synergistic changes. Significant revolutionary movements of human civilization in the field of agriculture, city, commerce and industry occurred as the result of self-referential non-linearly movements like this. Probed with the butterfly effect and the boomerang effect, civilization has the nature of complex adoptive system.

The complex adoptive system is an interactive system which develops itself through interactions of numerous elements, whose outcome is unpredictable from its initial condition. In this system, small coincidences or irregularities can cause a fundamental change. As one of complex adoptive systems, human civilization has experienced transformations inflicted by accidental inventions and discoveries, time and again. Civilizations are always exposed to and disturbed by contingencies and non-conclusiveness. The essence of civilization cannot be described by a uniformed simple law.

Generally, theories try to grasp the essence of complicated phenomenon by finding an abstract law extracted from the subject. But only with laws a complicated phenomenon cannot be thoroughly understood because they are mere an abstraction and a generalization of the phenomenon. A phenomenon has a

freedom to break a law. Countless theories have been produced so far in attempt to explain the complicated phenomenon that occur in civilization, but none of them wouldn't be good enough for the purpose. If any, it would be the one in which describe and explain the complexity of civilization as it is rather than simplifying it.

In civilization study, it is particularly important to look closely at the horizontal not vertical relation of civilizations. A civilization totally depends on a relationship. It can exist as civilization only among other civilizations. When some changes occur to a civilization so does it to the relationship, and when the relationship changes, so does the civilization. Civilizations develop and move forward by relating to other civilizations.

If something forming itself through relations is called a living thing and looking for a model of it in nature, civilization is one of the living things. Such elements as space, substance and life are all self-organizing, complex, living systems, and civilization is an extension of them. Civilization is a life that generates and develops through relations. In the animal world, neither individuals nor races last forever but life itself continue to exist. One civilization lives to follow the cycle of birth, growth and death, but it never ceases to exist. Human civilization is in the process of relentless evolution of lives and depends on leaps made by humans. Civilization is a process of creative evolution and a movement of life which never stops its changing and generating.

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