Where Has Entropy Gone: Theory of General System (II)

Zhen Wang
Physics Department, LiaoNing Normal University, Dalian 116029, P.R.China

Abstract

A pair of symmetric expressions for the second law of thermodynamics is put forward. The conservation and transfer of entropy is discussed and applied to problems like biology, culture and life itself. A new explanation is given to the cosmic expansion with the concept of diversity in this theory. The problem of contingency and necessity is also discussed.

I. Introduction

The world is a kaleidoscope. Both the lives in the world and the creations of the lives are tremendous. For us human being, mankind is the greatest life, human culture is the most wonderful creation. But if human culture could not help us transcend our limitation and enter the realm of freedom in a broader and higher sense, then it would not be great enough and mankind would be no more intelligent than other animals. Today human being has various kinds of culture and great amount of knowledge. But have we obtained an altitude at which we can have overlook at the various cultures, and a golden string to harmonically run through all knowledge? In the first paper I introduced the theory of uncertainty quanta in a general system, as well as some of its applications in some problems in physics and mathematics. In this paper we shall discuss another important part of the theory of general system, the conservation and transformation of order.

II. Discussion on the Second Law of Thermodynamics

The second law of thermodynamics is the most meaningful law in physics. It is profound not only because it is a law that has got the most discussion yet a law that is most strange to us, but also because it gives us the clue to the understanding of life, i.e. the famous arrow of time. For this famous arrow, physicists can at the most tell us that it is a natural choice. Today we would not understand more about it without the help of systematic view.

The second law points out that an isolated system will evolve in such a direction in which its entropy never decreases. This means there is a special direction in our life. The time arrow points to the direction in which an isolated system gets more and more chaotic
and disordered until its entropy gets to its maximum. The entropy is a variable indicating the disorder of the system. The bigger the entropy is, the lower the level of order of the system is. We call the order of a system its negative entropy. In this theory, the second law embodies the limitation of the observer system. After introducing the inversion relation of system, we’ll come back again to the discussion of the second law from a new angle (See the third paper “Quantum Cosmology”). Then the unsymmetry of the second law will appear in a wonderful symmetry relation. Here in this paper we shall only discuss it through the relationship between different systems. So we express the second law in such a way: a high-leveled (or highly ordered) system may deprive the negative entropy of low-leveled systems. In this theory, the second law is only a possibility, not a necessity. It is the reflection of the relationship between different systems. Thus in a sense, it is artificial.

Statistical physics tells us that the increase in the entropy means the increase in the microscopic weight of state of the system. We know that there is a correspondence between the states of a system and that of its environment on any time quantum. When we observe an isolated system evolving in accordance with the second law of thermodynamics, the system turns to be the environment of the observer. Thus on any time quantum of the observer, there is a correspondence of the state of the system with that of the observer. Actually, the second law tell us such a thing: the observer (the system) will correspond to such states of the isolated system (the environment) that get more and more microscopic weights. In other word, the degeneracy of the observer system gets higher. But what does this mean? The researches of functional material in recent decades has given us lots of inspiration. Some special functional materials can select or discern the polarity or direction of free radicals at a distance. The more ordered the functional material is, the stronger this selecting ability is. Just as we discussed in the first paper “System and Its Uncertainty Quanta”, this selecting ability is the ability of a system to fix its environment. It decides the abundance of its environment, which symbolizes the degeneracy of the system. The degeneracy of a system and the abundance of its environment are just the same thing. Therefore we see, a more ordered system can correspond to more states of its environment, thus has higher degeneracy. So the second law of thermodynamics actually reveals that in the evolution of an isolated system, the observer gets more ordered while the isolated system gets more disordered. Or you can say, there is a transfer of entropy.

Let’s see how the second law works. This is process which I call pararesonance of time quanta. Imagine a system A, which is of high synergistic level, and a system B, which is of relatively low level. Then according to this theory, we have $t_A < t_B$. As demonstrated in Figure 1, if $t_B$ is several times bigger than $t_A$, then A will see naturally a number of structures or possibilities, which B can not discern, in one time quantum of B. This makes it possible for A to affect the state of B at the will of A. Like or not, B has to face the influence that assimilate its time quantum to that synchronous with that of the A system. There must be the pararesonance because B is in the environment of A (otherwise, the two system
would be irrelevant so that the two systems do not exist relative to each other. See the discussion about the four kinds of relationship between systems in “Quantum Cosmology”). Such interaction happens in the basic structure of space and time and it provides a basic background of space and time. So it does exist. This is what I call the pararesonance. The time quantum of B is likely to be synchronized with that of systems that are of higher synergistic level. This means that it will disintegrate and lose its independence if it can not get enough negative entropy from its own environment to sustain its existence. Then it will have no independent time quantum of its own, which is just the case of the second law of thermodynamics.

But here the most meaningful byproduct we get from the above discussion is: If B can get enough negative entropy to sustain its existence, then such influence from higher leveled systems is beneficial to its order because it tends to break up its time quantum to smaller one. Moreover, when we think of the extreme case in which A is the perfect system with zero time quantum, we immediately get an amazing conclusion that such tendency is in fact the basic property or structure of finite time quanta for all systems. Thus we may also express the second law in the following form: a high-leveled (or more ordered) system may give negative entropy to low-leveled systems. Of course it is still nothing but a possibility. Now we have got two expressions for the second law of thermodynamics, which seem to be in conflict. In fact it is this conflict that embodies the equality and symmetry of all systems in a higher sense. The two expressions reveal two kinds of property or nature of a general system, which add to each other to give us a deeper and more integrated understanding of the world. I call the first the I expression (Increasing Expression), and the second the D expression (Decreasing Expression). Here many readers may come to the notion that the D expression will help us to understand vast quantity of phenomena in chemistry, biology, culture and even society. We shall discuss the problem in the next chapter. Practically, absolutely isolated system does not exist. The inner environment of a system is not closed and there are constant interchanges and transformation between the inner and outer environment. Therefore, to summarize the two expressions for the second law, we can get such conclusion for a general system: There may be entropy transfer between a system and its environment.

Physicists always take the second law of thermodynamics as an infallible precept, so that someone even declared that a theory might still be correct if it violates other laws in physics, but would be hopeless if it did not conform to the second law. In order to find out the truth, we have to face the danger of being hopeless. It is an interesting contrast that although scientists are so confident about the second law, they can not provide a harmonic and unified physics basis for the understanding of the vast phenomena of order in biology. Obviously, there must be a direction of time opposite to the classical second law. We shall find out the opposite direction of time in the third paper "Quantum Cosmology". Here for the time being, we shall only discuss the limitation of the second law from the general property of and relationship between a system and its environment. During recent decades researches...
in non-equilibrium thermodynamics have made a big progress. These achievements support the expression I give for the second law. The keypoint to understand this is to renew our idea for order. The nature of the order of a system, or the negative entropy as some physicists like to call it, is the degeneracy of the system with respect to the states of its environment. More ordered environment is farther away from equilibrium and has a smaller number of microscopic states, thus the subject system has a low degeneracy and low order. In such a case the negative entropy has been transferred from the system to its environment. Once we have such an understanding of the second law, we get the basis to renew our knowledge about this world.

Let’s study the case in Fig.1 further. What would happen if a lower-level system tries to imagine the environment of higher-level system? Obviously a lower-level system can only discern part or even a small part of the environment of the higher-level system, which is also a part of its own environment and seems to have no unusual significance to it. But the lower-level system will discover in its environment that there are not only phenomena of super speed of light but also violation of the second law of thermodynamics (classical form). Of course these may be out of the same reason. There is only one one-to-one correspondence between a system and its environment on one time quantum, and different correspondences are unfolded on different time quanta. If the B system, which has faith for classical expression of the second law, makes observation in its environment, it will find inexplicable phenomena. Why something or some state appear suddenly without intermediate course? Why the time can be reversed or transcend? In Fig. 1 the time quantum of B is four times as large as that of A, thus A can make four choices within one time quantum of B, of which B can’t be aware. On the other hand, when B is at the time P, A may have seen or even given some influence to the time Q in B’s time scale. In such a case, an incident of super speed of light happens to B. So the future of B is seen or influenced by A. Because such influence happens in the uncertainty time quantum of B, it can not but accept it as fate when the future becomes the present. Reversely, when B is at the point Q, A may have no difficulty in getting to the point P in B’s history. Then the second law of thermodynamics, the golden law of physics, is violated to B.

Physics has been generally regarded as the fundamental subject underlying all other sciences. But physicists have been long perplexed with the futility in providing an integrated picture to understand the phenomena in biology, let alone parapsychology and those unimaginable mysteries in nature. Of course the simplest and most efficient way to deal with those inexplicable in present theoretical frame is to denounce those as pseudoscience deserving no attention. But if we want to get a higher altitude to understand more, we must outstrip present theory, including the second law of thermodynamics. The purpose of science is to relieve human being from ideological barrier, no matter where the barrier comes from or whether it used to be beneficial to us.
III. The Conservation and Transfer of Entropy

The negative entropy symbolizes the order or the synergistic level of a system. When we talk about a system, we always have a corresponding environment. Here the environment is referred to the total environment including inner and outer environment. There is an one-to-one correspondence between the states of the system and its environment. The more ordered the system, the higher its degeneracy. This means it can correspond to more states of the environment in more efficient ways. There are many such examples for this in thermodynamics, biology and other researches like the functional materials, so it is not difficult to come to this point. But here there is no reason at all to dissuade us from interchanging the role of the system and the environment, i.e. to regard the system as the environment of its former environment. We said in the first paper "System and Its Uncertainty Quanta" that there is some arbitrariness in delimiting a system and its environment, which depends on the synergistic function and our interest in the problem. Therefore the system and its environment are born equal, and the correspondence between them is a mutual one-to-one correspondence between two infinite sets. The system can affect the environment and vice versa. The system can not master its environment completely because of its limitation, and the environment has to be affected by the system more or less. A system can act on purpose or selectively, but how can it deny with reasonable logic that the uncertainty in its environment comes out of some special purpose? If the system could, the uncertainty would not be uncertainty any more. In the third paper "Quantum Cosmology" we shall have deeper understanding about the symmetric relationship between a system and its environment. Here once we have enough spirit of equality and democracy to make the ideological breakthrough, we can immediately get a profound relation: there is a complementary relation between the entropy of the system and that of its environment. That is, the higher the degeneracy of the system, the lower the degeneracy of its environment. Or the more ordered the system, the less ordered its environment. If the entropy of the system is designated with $S$, and the entropy of its total environment $S'$, then we have

$$S + S' = 0 \quad (1)$$

In fact, in the researches for the dissipative structure in recent decades, such entropy conservation has already dimly emerged. There, the irreversible process that were formerly considered to generate disorder has become good assistance for producing order, order and disorder are less hostile, and disorder in some sense may be preparation for order in a broader sense. We can see from (1) that if we level systems according to their synergistic functions, then order and disordered together at any level. They are mutual and co-existent. In some sense whether they are order or disorder depends on how we see them. All order or disorder phenomena make up an inseparable and interwoven whole together with ourselves. Evolu-
tion of things is meaningless unless an environment is indicated. Environment is the content, object and ways of being of the synergistic function of a system. With synergistic function, some order is transferred from the system to its environment or reversely, which is in accordance with the expression I give for the second law of thermodynamics. Thus the order in the environment can be seen as to have come from its system. A system becomes the perfect system once it achieves perfect harmony. Such perfect system has infinite negative entropy and its environment has infinite entropy. So it is infinitely ordered and has an environment that is absolutely disordered, or you may say that the perfect system has infinite selecting ability and an absolutely obedient environment which, in fact, has completely merged into the system. But in practical we can find no concrete system to be perfect system because it is much more superior to us present system. The perfect system has no environment. It has zero mass and time quanta but infinite space quantum. We see from (1) that when different systems become the perfect system, they have no difference any more. They are totally the same. Yes, there is only one perfect system.

If we take a man as a system, we can have a better understanding in this theory about the difference among different people and between people and other kinds of lives, or more generally, other systems. Obviously, the difference is both inexorable and infinite. When two systems exist in the outer environments of each other, then for any one of them, the other does not exist. On the contrary, if two systems have enough common part in their environments, they must be able to find some linkage between them. In such a view, there must be some common part among people, among all lives, and even among all systems that are known to us. But there are also endless differences. The nature of the differences is that systems with different orders have different selecting abilities therefore different environments. In fact it is not difficult to come to this conclusion. What is really surprising is why it is so difficult for people to get rid of an unreasonable belief that all people, even all lives live in a common, independent and complete environment as is "commonly" sensed. Apparently this is an epistemological limitation. Equality at low level and in small range conceals inequality at high level and in large range.

As an example of the theory of general system, let’s study the human culture, which is something common and very important for human being. The word culture here is referred to the whole body of all kinds of special cultures. It is the linkage among individuals, arteries and veins of the society. No matter what form it may take, it is in its nature a relationship of life and surpasses all languages. Obviously culture is an order phenomenon. As we discussed above the order in culture can be seen as to have come from the order of human being. Thus in its nature culture is a phenomenon of life that has obtained negative entropy from mankind. In this sense, culture is no different from other animals on the earth. They are all assistants for human being to extract negative entropy from a wide background of disorder. They serve as storage of negative entropy for human being. This is why the culture system, or any of its subsystems like politics, economy, science, art, language and etc., show some
characters of life when it advances to a relatively high level. The evolution of human society also shows features of life. This has resulted in the similarities of methodologies, modes of development and basic difficulties in different areas. It is the same reason that gives vitality to many frontier and cross disciplines, just like a life develops a new organ or advances a new kind of function in a new environment.

But on another hand the culture system is significantly different from animal systems because it does not have mass, time and space quanta. Instead, its uncertainty quanta describe other properties than mass, time and space, or they are in different spaces in popular jargon. That’s why it does not have a visible and independent physical body like plants and animals, but only exists in people’s participation. So it is a completely parasitic life. It reveals the origin of its negative entropy more clearly than other order phenomena. All the plants and animals draw order from the vast disorder background in the most efficient ways for themselves and thus for us human being (remember, order means degeneracy in states). They have really been part of the life of human being. In this respect culture is far less efficient and helpful. It has both helpful and harmful effects. In some cases, it is just the harmful ingredient of culture that makes mankind feel ”hungry” and then appease its hunger with its own body. In this theory, because of the one-to-one correspondence between a system and its environment, the deterioration of our environment well embodies the withering of life of the mankind. Compared with real life in our environment, culture is a parasitic and low calibre life in its efficiency and harmonization for human being.

The function of culture has always been a controversial topic. Of course there would not be my present paper if there were no culture. For the gigantic system of the present human society, no social progress can be made without the help of culture. But order does not have only one form to take. (1) reminds us that culture is neither the aim nor a mark of human progress. It is only a tool in our way to perfection.

IV. Diversity and Uncertainty Quanta

In this theory, diversity of the environment is also an important concept symbolizing the level of order for a system. It is equivalent to an uncertainty quantum. They are the two sides of one coin. Diversity is the abundance of existence in the environment of a system, or equivalently the selecting ability of the system. Apparently, diversity is the relative variable of the environment for the degeneracy of the system. The higher degeneracy a system has, the more abundant its environment is, or the richer its diversity. From the point of uncertainty quanta we can also get a view on diversity. Smaller mass quantum means smaller basic brick for our physical reality, and thus more abundant forms of existence. We know that mass is closely related to energy, and mass quantum is a mark of the energy scale for system. Therefore we can say that system with smaller mass quantum is of higher level of energy, or
has stronger selecting ability, thus it can have more choices or get to more details in fixing its environment. So accompanied with the diversity is always a due selecting ability. Here we see again the same reasoning as in the mathematical consideration (See the first paper "System and Its Uncertainty Quanta"): infinite and infinitesimal, or rather, the up and low limits, are related in a profound way. Therefore we see that a rich diversity of the environment reveals a small basic unit, i.e., uncertainty quantum, which indicates a strong synergistic function and small uncertainty.

In such theory we can understand more deeply the implication of extinction of the species on the earth. According to some experts, a quarter of the present species will face danger of extinction in about thirty years. We know that lives in our environment are the richest collection as well as the most efficient storage of forms of physical entity. Thus for human being, such an indefinable loss will never limit its harmful influence only within our present industry and agriculture, but immerse us in a vast and threateningly clearing shroud of jeopardy. It has already changed our future in a way of which we are still unaware. It's true that we have advanced science and technology today, but we have lost biological diversity in our world, which is far more valuable. This means that the synergistic level of human individuals, thus the whole mankind, has been lowered down, or our human system is evolving in the way to disorder. You may also say that the descent in our synergistic level has resulted in the loss of biological diversity in our environment. In recent years more and more public concern has given to this problem. The loss of a life in our environment means a loss of order in our own life. What do we lose for the extinction of species in our environment?

The biological diversity is an appropriate indicator for human synergistic level from systematic angle. From (1) we see that a more ordered system has a more disordered environment. Thus richer biological diversity symbolizes a more ordered system and a more disordered environment. But here is a very important but often misleading concept that needs explanation. That is the concept of order. Why should a richer biological diversity designate a less ordered environment? As a matter of fact, life is itself a phenomenon of order in common sense. But to the observer system, it may be seen as concentrated manifestation of disorder of the environment, for an environment with more abundant biological diversity has more forms of existence, or more states. The concept of order involved in (1) is based on a more fundamental and more general meaning. It is the abundance of states of the basic particles (or rather, basic units) in the environment. The richer the life phenomena in the environment, the more states the environment has, thus the system has a higher degeneracy (corresponds to more environmental states) and is more ordered. It is the order manifested in individual lives that creates the diversity of states of the whole physical reality, or disorder of the environment, which in turn corresponds to the order of the system. Here again we see the transformation and interweaving of order and disorder. This supports our new expression for the second law of thermodynamics and adds to our understanding of the relation of (1).

Such profound relation between uncertainty quantum and diversity has been embodied
not only in mass quantum, but also in time quantum in the pararesonance, and in the
linkage of empty set and infinite in mathematics. Here we shall consider the counterpart
in space quantum, from which we get very naturally the relation of space quantum and the
cosmic expansion. Of course it is quite common to have different explanations for a same
phenomenon, which all might be correct to some extent. I don’t want to deny the success
of other theories in cosmic problems. But in my opinion, irregularity still means the defect
of the present theory unless we can endow some physical meaning to it that is reasonably as
well as logically acceptable. In this paper I just present a picture for the cosmic expansion.
There are still some theoretical details that need to be worked out for other phenomena
observed.

We have seen from the above discussion that some high calibre order has been turned
into low calibre order in human system because of the loss of negative entropy. Therefore the
synergistic level of human system in general has been lowered down (See also the third paper
"Quantum Cosmology" ). That means the mass and time quanta are being enlarged while
the space quantum is being shortened. We know that the space quantum is the smallest
distance in which all spacial points are equal. It is the basic unit of our space and we know
nothing inside the basic brick. So we have not the least reason to assume that inside the
uncertainty quantum there is nothing worth consideration but a trivial series convergent to
limit zero. We should not make any assumption for the property of uncertainty quantum
related to its inner structure, no matter how reasonable it might seem, because that is beyond
our comprehension according to the definition of uncertainty quanta. As a matter of fact,
fractal geometry has given very good examples of divergence. In my theory, the expansion
of the universe is just the direct result of the reduction of the space quantum in human
system. The reduction of the space quantum implies the reduction of the "length" that
is composed of equivalent and indistinguishable points. As a result, some "distance" that
was formerly composed of equivalent and indistinguishable points becomes unequivalent and
distinguishable. Thus there must be an increase in the visible spacial distance. In other
word, some visible distance has been "produced" from the space quantum, the basic unit of
space, resulting in the expansion of the space.

The cosmic expansion is the experimental cornerstone of present cosmology. What kind
of cosmology will our brand-new explanation for the phenomenon lead to ? We shall have
further discussion for this problem in the third paper "Quantum Cosmology”.

V. Evolution of Life

There is a tremendous saying in philosophy that space and time are the way of being for
matter, which reveals the dependence of space and time on mass. In fact it is only a part
of a more profound relation. A specific environment, which is described with three specific
uncertainty quanta, always belongs to a specific system. More ordered system has more powerful synergistic function and thus corresponds to more states of its environment, therefore it has a more abundant environment. There is an one-to-one correspondence between the states of a system and its environment. In this sense, a man has no essential difference from other forms of life. They all have some degeneracy and independence relative to the environment. But what is the nature of life?

Scientific developments seem to have accumulated more and more evidence that all life activities have physical basis and are ensured with matter in specific ordered form, and all spiritual processes correspond to some physical changes. But I am afraid that most people do not agree on such view of extreme reductionism. People even have developed special science and therapeutics for spiritual behaviour. But such subject has never found in physics its basis that can be widely accepted. People can say nothing about the nature of spiritual activity but that it is a kind of function of the brain. Spiritual activity is one of the most important features of life phenomena, so we still have a long way to go for the understanding of life. But here is a prerequisite, i.e., we must first admit that the nature of life phenomena can be understood. If there were something in our world that we would never be able to understand, then all the knowledge that human being has acquired would be of no sense: a law would not be a law if it might fail at any time and nothing would exist in a world with no laws.

In my theory, the diversity and uncertainty are not only the basic characteristic of life but also constitute the essential part of it. Systems with high synergistic level have rich environments. A system and its environment have the relation revealed in (1). Spiritual activity has two meanings. One is the richness of diversity in environment. Obviously, systems with rich diversities have high degeneracy according to our above discussion, therefore are more ordered and have rich spiritual activities. In this sense different life systems may have enormous differences in their spiritual behaviour because of the differences in their environments. On the other hand, it is uncertainty that more notably reminds us the existence of spirit in daily activity. In fact it is the more profound side of spirit. Uncertainty comes from the outer environment of our system and it reveals the limitation of our selecting ability. What is more important, in manifestation for our limitation it shows us the infinite potential of cognition we have, i.e., all limitations can be realized by us in their nature. This potential is the same for all life systems, which epitomizes the conservative relation implied in (1). The correspondence relationship between system and its environment is the same in nature for all systems, no matter high or low. In such a sense, spiritual and life phenomena all acquire some kind of absolute meaning. We shall have further discussion about the relative and the absolute meaning of life in the third paper "Quantum Cosmology".

History tells us that although human society has always developed in the direction toward wider and wider equality (it is so because the society also has life feature, according to my theory), it has always been very difficult for human being to get rid of a sense of superiority.
So whenever scientific progress abolishes a special advantageous status of mankind, it always gives people a great shock for a period. As is often seen, this blind sense of superiority usually accompanies the lack of self-confidence. The development of computer gives a good example. Today computers are so advanced that some people begin to worry about the possibility that a race of computer may emerge and threaten human being some day. In fact this is impossible. In the abundant diversity of human environment, there is enormous amount of incalculable ingredient as well as calculable ingredient. We have three uncertainty quanta for mass, space and time, which gives us a very good sense of consciousness of our environment. Such sense of consciousness would be greatly different for an inorganic system, whose environment is too simple because of its poor synergistic function. No matter how advanced future computer technology will be, the computer, in common sense, is only a simple system with only one uncertainty quantum for mathematics, mere extension of human organ. Its physical structure is too simple to hold enough negative entropy for it to develop its own mass, space and time quanta which are delicate enough to make it alive. As a system with three uncertainty quanta in general sense, it is even less ordered than an ant. It is more preposterous to think that a race of computer would threaten the whole human being. What is more, can the evolution of life take such direct route that surmounts the significant difference between organism and inorganism?

Darwin’s theory of evolution tells us that a species gradually completes itself on its way of evolution through natural selection. Environment plays a crucial role in this process. Variations are maintained and developed when they suit the environment, diminished and eliminated when doesn’t. This theory has achieved great success. But the mutation in this theory is random incident that lacks explanation. In our theory, because of the one-to-one correspondence between system and its environment, system fixes its environment with its synergistic function, reversely, changes in the environment require appropriate variation of the system, no matter whether we can perceive the changes. Therefore all variations of the system are induced by some specific environment, and they embody some requirements of the environment. Without suitable environment a system can not emerge and exist. We are constantly changing, so is our environment, which in turn constantly induces new systems to realize the changes in a most efficient way. Life develops like this. Strictly speaking, there is no such thing as mutation. Even birth and death, the special mutations of life, are also embodiment of the requirement of changes in the relationship between system and its environment (See the third paper "Quantum Cosmology") . The word mutation still symbolizes the limitation in our knowledge. But if so, what causes change?

As a matter of fact, once we get further understanding of the nature of time, then evolution itself is also relative. The development in some function means increasing of order in this respect. But doesn’t the order increase in one aspect at the price of decreasing in another aspect? Doesn’t it increase in a small scope at the price of decreasing in a large scope? We see from (1) that entropy can not be created but only flow from system to environment
or reversely, which correspond to the expression I give for the second law of thermodynamics. Therefore evolution of life should be appraised from its total synergistic function, from its whole environment and from all the relationship between it and its environment, rather than partially concentrated on some particular functions.

In recent decades studies in dissipative structure have given us some inspiration for the problem of origin of life. Our environment is in constant change, so it may become quite common for a system, away or even far away from equilibrium, to appear. Thus it is imaginable that some phenomena of self organization may emerge under some special conditions. But the problem of genesis of life has not been completely solved. Why is our environment always in change? No satisfactory solution for the problem can be found without a profound understanding of the nature of time. On what basis is the symmetry of the I Expression and D Expression of the second law established? How and why did the universe originate? We should have an integrated and harmonic theory to understand these questions, which we shall have further discussion in the third paper “Quantum Cosmology”.

VI. Contingency and Necessity

Is this a world of contingency or necessity? Is everything in this world ruled by probability or by a supreme adjudicator? Such questions have been a topic of dispute for philosophers for a long time. According to this theory, different systems have different environments. Thus any contingency and necessity must be related to a specific system and its environment, therefore relative. The contingency and necessity in an environment reveal the synergistic level of the system to which the environment belongs.

Different systems may be of different synergistic levels and have different, even opposite aims for the selection of environment. In such case, the environment will be fixed at the will of the high-leveled system at the price of some extra order, because both systems have to face the increased unsymmetry in their environments. As I said above, this fixation is relative and still affected with uncertainty revealing the limitation. Suppose there are two systems P and Q, with Q being of higher synergistic level, and an incident Y in the common part of their environment. Thus Y is related with both P and Q, though strictly speaking, it may have different forms of existence in the two environments. If their aims in fixing the environment are close or in accordance with each other, both of them will save order (remember, order represents degeneracy). But if their aims are contradictory, Y will be decided by Q, and both of them will lose some order to balance the increased order in their environments. Then the environment is necessitarian and deterministic for Q but contingent and undecidable for P. So we see that it depends on the selecting ability or the synergistic level of the system what roles contingency and necessity play in its environment.
Strictly speaking, every imperfect system P may be in the environment of a more highly-leveled system Q, which has smaller mass and time quanta and larger space quantum. Thus Q can fix the environment of P system in P’s outer environment in a way that is imperceivable to P. That is, when a high-leveled system observes a lower-leveled system in its environment, it will clearly see the contingency in the lower-leveled system, because for one state of the latter, the high-leveled system may have several equivalent states to choose from. When the high-leveled system is the perfect system with zero mass and time quanta and infinite space quantum, then fortuity in an ordinary system is absolute and inevitable. That is the fortuity in an imperfect system, because all imperfect systems are in correlation with its environment in the level of the perfect system.

We may also have an understanding on this problem from another angle. As we know, the state of a system can be described with three uncertainty quanta which, as the name suggests, also reveal the uncertainty in the environment of the system. A system can not perceive the changes in its outer environment, i.e., changes smaller than its mass and time quanta but larger than its space quantum, therefore it has to face the results of these changes without knowing the reason. So there must be contingency in its environment. Limited space quantum restricts the range of the synergistic function of the system. On any time quantum, a system can only act on matter within its space quantum, which, according to our discussion on correlation in the first paper ”System and Its Uncertainty Quanta”, is actually correlated to all the matter in the entire environment.

It is the same with human world. Contingency and necessity coexist. This means there are still things that people can not fix or control. But there have never been earnest logic or conclusive proof to show that people can not get rid of fortuity in their environments. Where has the contingency in human world originated? Obedience to fate as well as blind arrogance often seriously restrict our thinking on this question. In this theory, a system with limited uncertainty quanta is doomed to have fortuity in its environment. Though fortuity can not be avoided in daily life for ordinary people, it may be quite different during different periods or among different people. In fact, human history is the records of victories over contingency, in which the developments of science are the milestones of human emancipation. As the best embodiment of the human spirit in pursuit for truth, science contains the most positive factors of life in a profound way. Einstein was correct. God never plays dice. But unfortunately we are not God. Science today has not given us His omnipotence yet. Then can a system really get to the perfect state in which the system has zero mass and time quanta but infinite space quantum, so that thoroughly wipes out contingency? The answer of this theory is yes. That is the very important concept of perfect system in our theory, which is in fact the starting point for us to understand the world. We shall discuss it in the third paper ”Quantum Cosmology”. 

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