

From Complex System to Integrative Science

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Aspects of the theme and its development

This paper aims to introduce my thinking as an ‘anti-logocentrism’. To begin with, I would like to point out two aspects of this theme. First, even if philosophical thinking is essentially based on logical form, it is sometimes exposed to illogicality. But this illogicality is meaningful. Secondly, this has to do with differences between western thinking and my thinking: the former respects rational thinking and follows strictly formal logic, namely logocentrism.

It is true that we cannot think without rationality, but when, for example, we deal with complex systems, we cannot follow the law of the excluded middle because of the contradictory reciprocal effects that coexist in the complex system of an interface. The two contradictory effects come across and complement each other in an interface, and for this reason we cannot think rationally. The middle line between the two effects must be excluded in a complex system, so the coexistence frequently gives rise to chaotic situations.

We know that a new culture arises in the border area between different cultures. Between two cultures, where there is a view of the world that is mutually quite contrary, the following happens. For example, on the border between two countries, there are times when their two religions, which differ completely, become one. A world which is more open is required here. This requirement is the power that overcomes the contradiction.

Will this requirement really arise anywhere? It occurs because of the complex system at the interface between the two countries which is composed of past factors and the desire for a future. So unexpected occurrences go beyond the level of the individual will here. But this complex system at an interface is not like Hegel’s “world mind” (*Weltgeist*). It is not at the level of idealism, but of ontology as a boundary domain.

We should follow the law of excluded middle in epistemology, but not always in ontology. The beings in the world, as complex systems, possess contradiction. In contradiction we cannot discover a rule that can be understood logically, but sometimes a new meaning is discovered in it. This is the sort of thing in which much learning is contained in an irrational occurrence. New information happens to emerge out of the chaotic situation as the result of self-organization.

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We do not learn at all from illogical characteristics, but we can learn much from contradiction. In philosophy meaningful thought is much more important than logical thought. Logical thought merely relates to conscious operations, but meaningful thought attaches a deeper significance to existence. Philosophical thinking will reach the depths of existence through meaningful thought.

Complex systems involve an encounter. Therefore we must choose meaningful thought here. Does meaningful thought have some sort of complex mechanism? The meaning is in the value and importance it has in linking things. A construction of linkage against non-order is a complex system, that is to say, unbalanced/non-equilibrated phenomena.

A typical example is the convection of fluid. We can imagine fluid such as soup in a saucepan. If we heat the bottom of the pan there is conduction of heat, since the bottom is hot and the upper part is in contact with cold air. If we heat the bottom further, the fluid in the bottom expands thermally and becomes lighter. Thus, due to the force of buoyancy, the fluid starts to move upwards. At first, due to viscosity, the fluid cannot move easily, but beyond a certain temperature at the bottom buoyancy overcomes viscosity and sets the fluid in motion, a process known as convection. Then the efficiency of heat transfer is greater due to the fluid in motion. The efficiency of the linkage, namely the transfer of heat, is largely due to the motion. Thus heating the bottom causes more efficient release of heat from the upper surface.

The motion of fluid is characterized by “auto-catalysis”, as it were – anti-logical meanings, namely non-excluded middle action as the link between bottom up and top down. Auto-catalysis in its original meaning is used in chemical reactions, implying that the product of a reaction accelerates the reaction itself. Of course fluid motion and chemical reaction are totally different. Once a small movement of fluid starts, it grows due to the upward flow (bottom up) of the buoyancy force and the counter-flow (top down) caused by the colder part at the top of the fluid. The upward flow and the counter-flow do not comply with the law of excluded middle, but these flows are linked together by auto-catalysis. If we further increase the temperature of the bottom, we may have chaotic behaviour. Then the system often turns into chaos; this is a turbulent flow. The middle between the bottom up and the top down has to be excluded in a complex system such as the convection of fluid.

Such auto-catalysis is manifested only when the system is driven away from equilibrium. Even simple non-equilibrium chemical systems can form remarkably complex patterns of chemical concentrations, varying in time and space in striking ways. Ilya Prigogine called these systems dissipative structures, because they persistently dissipate matter and energy in order to maintain their structures (cf. Kauffman 1995). In macroscopic physics the appearance of dissipative structures has been confirmed by many experiments.

We inherited two worldviews from 19th-century science, namely those of dynamics and thermodynamics. Both are pessimistic. From the dynamic point of view nothing is really happening; everything appears in a pre-determined way as part of a moving machine. From the thermodynamic viewpoint everything leads to death, thermal death. Therefore the emergence of structures far from equilibrium was very important, because it showed that time plays a creative role; that in a state far from equilibrium new things are happening and will continue to happen. So we may see our world as one of non-equilibrium in which new things happen all the time.

The new emerging structures arise from non-linearity and involve a critical distance from equilibrium. There we have the so-called dissipated structures, self-organization, bifurcations, leading to an enormous variety of situations, going on and on. In this way we have to some extent an explanation of the variety of situations we see in nature, because complexity and variety are characteristics of nature.

Consequently there must be a background which beforehand forms the linking pattern, as in Bénard cells (convection). The background is the place as a system, where, for example, the

upward-flow (bottom up) and the counter-flow (top down) are linked together by auto-catalysis in a convection.

Only when it can be integrated as part of a system does an entity have simultaneously the characteristic linkage with other things. Since being contained in position as a system makes the linkage with other entities possible, it forms a kind of unified meaning. Being contained and containing reciprocally makes up the complex system and forms the unified linkage of a system. Chaos sometimes causes complex systems to waver in their linkage. But chaos is a word with several meanings. Illogical characteristics of chaos also have unique meanings. The complex systems themselves express some of an entity's meanings.

The entity is contained in position as a system at the same time as the position as system is contained in existence on the complex system. A paradoxical cycle like this means there has been emergence of auto-catalysis.

Complex systems are always in the sense of an existence. The relationship between the existence and the place as a system has so far been called the "complex system". A is contained in B, at the same time as B is contained in A. This two-way thinking can be matched with a definition of the word "complex" and a mechanism of "interface" between A and B. The word "complex" is derived from Latin, *com+plecto*; "complectere" means to weave reciprocally. A woven into B is simultaneously B woven into A. The law of excluded middle does not come into existence at the simultaneity.

Generally existence is displayed as an individual existence and position is displayed as the world of a system. An individual is enveloped in the world of a system at the same time as the world of a system is enveloped in the individual. In this case of being reciprocally enveloped we can think of Leibniz's "monad" because the monad, exactly like the mirror, has the world expressed in it. The monad is wrapped in the world; at the same time the world is wrapped in the monad. In a sense, the world of monadology is also a sort of complex system.

Klaus Mainzer has identified a complex system as dynamic motion of "Bottom Up" and "Top Down". In self-organization and emergence of order in a whole system with the macro-dynamics of global structure, the dynamic motion of Bottom Up and Top Down affects individuals and their activity with micro-dynamics. The middle between macro-level and micro-level is excluded through the reciprocal interpenetration by the dynamic motion of Top Down and Bottom Up, but it is converted into self-organization and emergence of a new order. It is due to a non-excluded middle action or the simultaneity of Top Down and Bottom Up that self-organization and emergence of a new order fulfil their function. We will look at a self-organization problem in biological systems. Here we consider the pattern formation of simple cellular moulds.

The life cycle of simple cellular moulds is quite remarkable. Ordinarily the simple mould lives as an amoeba and multiplies by cell division. But under unfavourable conditions amoebae aggregate into a cluster state, called a slug, which moves just like a large amoeba. The slug exhibits remarkable change, becoming a fruiting body like a mushroom and releasing spores into the air. The spores are borne by the wind, and return to the amoeba state.

Here we will show a theoretical model for the slug-formation from amoebae to slug. Each amoeba emits chemical attractants called cyclic-AMP (C-AMP) for a period of several minutes. Each amoeba has a different native frequency, but when they aggregate, the oscillations of many amoebae synchronize through the penetration of each other with a non-excluded middle action in the final stage.

The experimental data show the results obtained by the theoretical model, where the moving velocity of a slug is plotted against the synchronization parameter $\varepsilon(\text{C-AMP})$. When the chemical oscillations of each amoeba do not synchronize, the velocity of the slug is almost zero ($\varepsilon < 55$), but

when full synchronization occurs ($\varepsilon > 62$), the velocity becomes very high and then gradually decreases. A remarkable point is that maximum speed is obtained at the edge of synchronization, where chaotic partial synchronicity occurs.

Even more interesting is the fact that positional information is clearly generated in a slug. Chemical oscillation in the slug's head is in an advanced phase while that in the tail is in a retarded phase. These theoretical results explain the experimental data very well.

The positional information here is decided by the change in chemical oscillation through the reciprocal penetration in a non-excluded middle action. Both extremes of speed occur at the edge of synchronization in the chemical oscillation. An advanced phase makes the slug's head, but a retarded phase makes the tail. The information making the slug's head or tail emerges from chaotic partial synchronicity with Mainzer's dynamic motion of Bottom Up and Top Down. This dynamic motion is the epistemological expression of a non-excluded middle action.

The chaotic partial synchronicity takes place from the point of reciprocal penetration of the chemical oscillation. Self-organization of a head or tail has been created by positional information. The information is decided by position in the place where reciprocal penetration is on a non-excluded middle action. This is the definition of information. Therefore a head and a tail are a posteriori recognized as information. So a head and a tail have positional information about each other pre-consciously.

It is a key question that we ask, not about a simultaneous Yes and No, good and bad, true and false, but the place where there is reciprocal penetration. We ought to think of the ontological meanings of place as positional information.

From the above it is clear that a continuum between macro-level as a whole system and micro-level as an individual is possible with a non-excluded middle action. We can rephrase "continuum" as "integration". I feel inclined to grasp Mainzer's dynamic motion as the simultaneity of Top Down and Bottom Up or a non-excluded middle action. I will call this "integrative science theory" in the following way. We ought to move from the "law of excluded middle" to the "integrative science theory" now. A boundary region or "interface" is a matter of great importance to us.

The fact that the world of an interface is expressed as a complex system, namely the middle between macro-level and micro-level, means that individuals are contained in the world simultaneously with the world being contained in an individual such as the monad.

The monad is simple existence which has no parts, but in which it is possible to express the whole world. For that reason the monad is the expressive function itself. The expression of the world means an infinitesimal perception or a perception or apperception, or even a consciousness (cf. Leibniz, *Monadology* 14, 21). The infinitesimal perception already started expressing the world before becoming consciousness. With such a meaning we have started expressing the world with our infinitesimal perceptions, not our consciousness but our pre-consciousness.

Since we have infinitesimal perception or infinitesimal memory in irreversible succession just like the monad, we can cause it to affect our conduct smoothly without our consciousness. With the benefit of such a mechanism, it can be adapted to our environment. In this case you do not have to misunderstand that infinitesimal perception or memory is "unconsciousness". Unconsciousness is something whereby consciousness is suppressed, so that it is a kind of contradiction. This memory has been connected to the start and the end of the world. Leibniz called this "the law of continuum" (*lex continui*).

This law is not anything of which we can be conscious and which is intelligible, but something that certainly exists. Since *lex continui*, namely the truth of an existence, is latent and tacit, we cannot recognize or elucidate it. We have no consciousness but rather pre-consciousness or fore-consciousness of it. The fore-consciousness is a tacit agreement (cf. Leibniz, "*cogitatio caeca*").

Consequently we have to handle this law as an existence unto itself. The most continuous existence is not a species and a genus, but an individual. Species and genus are no more than a nominal, but only an individual is the actual being. The most continuous existence is the actual being.

An individual being is “an existence possibility of becoming a most specific being” (cf. Heidegger, “*das eigenste Seinskönnen*”). An individual being is contained in the world as system (Mainzer’s “Top Down”) and at the same time the world is contained in an individual being (Mainzer’s “Bottom Up”). A non-excluded middle action or the simultaneity of Top Down and Bottom Up between individuals and the world as a system is how it is possible to be contained in the world and at the same time to contain the world. The infinitesimal perception or infinitesimal memory is formed between the individual being and the world as a system by Mainzer’s dynamic motion. That is to say, this memory emerges from an interface of the complex system which is formed between the individual being and the world as a system.

Accordingly the individual being and the world are integrated as a system in it. The individual being, in the individual formation process, wraps the world as a complex system. We are able to have our individual formation process in ourselves because of our infinitesimal perception or infinitesimal memory. This memory has started expressing the world from the respective standpoint. To express it like the mirror means to contain the world. The memory which can be contained in the world is equal to the memory of individuality which contains the world like a monad.

The possible fact that we can be wrapped in the world means that we wrap the world simultaneously on the basis of monadological thinking. To be wrapped and simultaneously wrapping logically implies a paradox, but the argument is sound ontologically. As a general rule it is difficult to tolerate paradox. As for us it was without being able to sneak out of the traditional formal logical thought. Traditional philosophy was just loyalty to the rational experience, but forgetting actual entity. Why was it forgotten? Because an actual entity, namely the most strictly continuous existence, was not a reversible being but an irreversible continuum like an arrow of time. It is easy for an irreversible continuum to be missed immediately. But we ought to remember it fore-consciously as the infinitesimal memory.

To do that we need to begin the new thinking based on the infinitesimal perception or infinitesimal memory. The being was forgotten chiefly because we were firmly captive to subjective consciousness. Infinitesimal memory easily escapes our attention. We should never forget our infinitesimal perception and infinitesimal memory. The new thinking must accept the bare fact of the formation of the being as a system, namely the individual formation process with a non-excluded middle action to other things. Here it is very important to put the question as to what is bare fact. The ability to look around the world is now required.

With regard to this ability, we must integrate our intellect, emotion and volition into one as a system. We should like to think this is an integrated ability. The individual being and the world are integrated as a system in the infinitesimal memory. Though we have no recollection of the infinitesimal memory, the “continuum law” can instruct us about this memory’s whereabouts.

Integrated ability is based on this instruction. We must give full credit to this ability, which is based on open-mindedness. It is open-mindedness, not understanding, that places trust in our infinitesimal memory. It is integrated science founded on instruction that brings about this integrated ability. The integrated science is not the so-called “*universalis sapientia*” or Cartesianism, but renewable monadology as a complex system.

Renewable monadology takes a strong stand on the “continuum law” (*lex continui*), and also on the irreversible continuum. *Universalis sapientia* has put itself in the place of the reversible continuum. Universal knowledge must be reversibility as a cycle. But unfortunately we cannot grasp the gist of actual entity with knowledge.

Philosophical thinking

Ordinary modern philosophers have easily overlooked a “non-excluded middle action”. They are not willing to understand the significant gist of actual entity. Descartes’s philosophy is a case in point. He wrote in his *Regulae ad directionem ingenii* as follows:

If we are to distinguish the most simple things from those that are complex, and if we are to advance from the former to the latter in due order, we must proceed as follows: in any series of things [that is, in any sequence of truths] which we deduced directly one by one from another, we must observe which term is the simplest of all, and how the other terms are related to that simplest term, namely, whether they are [as compared with one another] more, or less, or equally removed from it. (Rule 6)

For Descartes the continuum is the series each of which we can directly deduce one by one from the previous one. As the series of things is formed from our deduction and must be reversible, they are not an actual entity, but only a succession of the simplest things. Consequently the so-called simplest things are ideal, not real. If anything, the ideal continuum does not follow a “non-excluded middle action”, but follows “the law of excluded middle”. I will give a detailed account of both differences later.

The most complex things cannot be explained with a succession of the simplest things. The ideal continuum can be reversible so that as a result we can observe how the other terms are related to that simplest term. The complex things of actual entity cannot be reversible in the continuum, but irreversible. This is the reason why we cannot observe complex things directly.

The fact that actual entity is grasped by us not consciously but fore-consciously does not agree with formal logical truth. The reason is that actual entity is never composed of any analytical terms or two extreme terms. On the contrary, Descartes was thinking of them consciously, that is, distinctly and clearly. His thinking abided strictly by the law of excluded middle; he kept a non-excluded middle action out of his thinking. We can bring forth evidence to show that Descartes is thinking on the basis of the law in the pages that follow.

The type of practice Descartes has in mind is shown by an example:

If we note that 6 is twice 3, we may go on to ask what is twice 6, and we find the answer is 12. We may then proceed to double 12, that is 24, and then double again, which is 48. We can easily deduce that there is the same proportion or ratio between 3 and 6 as there is between 6 and 12, and likewise 12 and 24 and so on, and hence arrive at the conclusion that the numbers 3,6,12,24,48, etc., are in a continued proportion. This may seem childish, but we may grasp, from an attentive study of this series, just what is the form involved in all problems which can be propounded about the proportions or habitual ratios of things and the order in which they should be investigated: and this discovery embraces the whole science of Pure Mathematics. (Rule 6)

Originally the two extremes ought to have the relationship p and non- p . However, when Descartes thinks about the two extremes 3 and 12, he takes at the same time the mean proportion 6 into consideration. Therefore Descartes seems to overcome the law of excluded middle, that is to say, the middle 6 is not excluded, and our guess is completely wide of the mark. We must not forget that we realize the meaning of the middle 6 only when the premise of two extremes 3 and 12 is assumed in advance. For that reason the difficulty would be greater if the given extremes were 3 and 24 and we had to determine one of the proportional intermediates, in this case 6 and 12.

Many middles between two extremes imply the labyrinth of continuum (*de compositione continui*), because there are innumerable middles between the two extremes. Descartes is unsuccessful

in understanding any series of things, because his thinking is based upon the law of excluded middle. Why does the proportional intermediate not represent the real middle? Because it is only a reversible process as in a cycle. But the real middle of actual entity is an irreversible process like a stream.

There is a difference between ideal and real, or consciousness and fore-consciousness. It is based on formal logic that Descartes thinks of the two extremes. Descartes' basis should be called "logocentrism" as the "law of excluded middle", while the foundation of actual entity can be called a "non-excluded middle action" such as anti-logocentrism.

Einstein's basis ought also to be called logocentrism. He answered again and again, "Irreversibility is an illusion, a subjective impression, an anti-logocentrism coming from exceptional initial conditions." His old friend Michele Besso remained dissatisfied. His last scientific paper was a contribution to the *Archives des Sciences* published in Geneva. At the age of 80 he presented an attempt to reconcile general relativity and irreversibility of time.

Einstein was not happy with this attempt: "You are on sliding ground," he wrote. "There is no irreversibility in the basic laws of physics. You have to accept the idea that subjective time with its emphasis on the now has no objective meaning."

When Besso passed away, Einstein wrote a moving letter to his widow and son: "Michele has preceded me a little in leaving this strange world. This is not important. For us who are convinced physicists, the distinction between the past, the present and the future is only an illusion, however persistent."

Reversible time has no past, present or future; this distinction does not actually mean anything. Any past or any future is able to be concerned with the present. The distinction between past, present and future is only order, which does not mean actual entity. Actual entity is only an illusion. For Einstein there is no real middle of actual entity. He believed in a world without an interface, namely the middle or an intermediate as a complex system.

In this concept there is no place for free creation, for contingency, for human freedom. Any contingency, any randomness that seems to exist is only apparent. If we think that our actions are free, this is only because we are ignorant of their true causes. The distinction between past, present and future is only apparent.

Einstein's god is not the god who plays dice but supreme rationality. His concept is a stance that is called logocentrism. Logocentrism comes into existence in complete laws and orders in a world which objectively exists. Irreversible time is only apparent in this world. The reason why Einstein could not put a question to the present as an interface between the past and the future is because he thought with supreme rationality. In his thinking there was no irreversible distinction between past, present and future. When all is said and done he did not know any complex system, and above all a concept of interface. He could not see actual entity, so that he thought it as reversibility only ideally. His supreme rationality had dismissed the irreversibility of actual entity.

When we think of the present as reality, we must concentrate on an interface between past and future. The interface is no doubt the vivid present, namely the ontological middle of actual entity. There is no such interface in the world as reversibility. The world as reversibility is the system of epistemology, the world as interface is by contrast the ontological system.

Ilya Prigogine said, "I believe that the main progress that has been accomplished is that we begin to see that probability is not necessarily associated with ignorance, that the distance between deterministic descriptions and probabilistic descriptions is less great than most contemporaries of Einstein and Einstein himself were believing." Einstein's way of thinking is based upon a reversible succession in a cycle. The order in a cycle can be represented with deterministic descriptions. However, the actual distinction between past, present and future is never the order in a cycle. The

past, the present and the future are not illusion, but a natural irreversible process. They are not in a cycle. Though they were not reversible Einstein reduced them to a reversible succession. This reductionism ignores the irreversibility of actual entity as a flow of time.

We can relate this reductionism to the distance between deterministic descriptions and probabilistic descriptions. This relationship makes a specific character of the reductionism clear. We will probably understand that reductionism has some kind of essence. Reductionism is in the habit of being able to deny the ontological middle of actual entity.

The ontological middle of actual entity is an irreversible process as a flow. How is the structure of irreversibility composed? Factors are wrapped in a flow, at the same time as the flow is wrapped in factors. This is just like a flow of genetic code. Genes (micro-level=A) are wrapped in a flow of genetic code (macro-level=B), and at the same time a flow of genetic code is wrapped in genes. The relationship between A and B is called an “interface” in a complex system. A and B are in the state of reciprocal interpenetration by Mainzer’s dynamic motion of Bottom Up and Top Down. An interface between A and B is frequently converted into self-organization and emergence of a new order. In this way a great gap (=middle) between A and B is made up. This is “integrative science”. I should like to call the complex system based on Mainzer’s dynamic motion the “integrative science theory”.

For the reason mentioned above the complex system of life is grounded in infinitesimal perception or infinitesimal memory as genetic code in a complex succession. Frankly speaking, it is an irreversible succession of non-equilibrium process. Infinitesimal perception or infinitesimal memory is just like a genetic world. They have a character of genetic information.

In terms of complex systems it is not acceptable to choose only one possibility and deny the opposite. Complex systems are not founded on the law of excluded middle. If anything they have the real middle to be non-excluded by integrative science theory. The system is involved in an interface between one possibility and the opposite, that is to say, in a relationship between A and B (=non A).

We have to remain between contradictory things and need more patience and tolerance for these betwixt and between states. It is not uncommon to see such ambiguous situations, but we often overlook them. However these situations are not as disordered as we think, and they can be accepted as they actually are. To take things as they are, actual entity is very important in order to think of complex systems.

I would like to refer to such thinking as “passive thinking of being wrapped”. In this way there are two types of philosophical thinking. One is a reflective rational thinking, namely logocentrism, and the other is a passive thinking of being wrapped, namely anti-logocentrism. The latter often stays within the contradiction without following logical form, which occurs in interfaces of complex systems. In such cases we cannot think rationally as in self-organization, because directly opposed (contradictory) effects coexist there.

Furthermore, we find something completely new there, that is to say, “emergent property” that is just what only passive thinking of being wrapped deals with. It is possible only for passive thinking directly to accept real things as actual entity, but impossible for reflective rational thinking. We must investigate in detail the differences between the two forms of thinking.

Thus there are two types of philosophical thinking. One follows logical form just like a genetic factor analysis (=genotype) in genetics, the other does not follow it just like the genetic series (=phenotype) in the theory of evolution. How should we think about the difference between these two types? It is just the integrative science of genetics and evolutionism that we wanted. But can we overcome the difference between these two types philosophically?

To begin with, why do we have the two different types? Because genes (micro-level) are wrapped in the genetic series (macro-level), at the same time as the genetic series is wrapped in

genes. Genetics is organized insofar as genetic factors are contained in an individual; the theory of evolution is organized insofar as an individual is contained within the genetic series. The interface between the genetic series as macro-level and genes as micro-level should be integrated by Mainzer's dynamic motion of Bottom Up and Top Down. The interface is necessarily formed on the basis of a non-excluded middle action which takes the place of self-organization and an emergence of new order. There is no interface without a non-excluded middle action or the simultaneity of Top Down and Bottom Up. We cannot set a definite limit to a non-excluded middle between Top Down and Bottom Up, but the middle is casting its reflection on the interface. Therefore we can see the projection just like seeing a growth ring. It is a phenotype.

Accordingly, the integrated science of genetics and evolutionism can be based on the ontology of this case of being wrapped reciprocally just like Mainzer's dynamic motion. This dynamic motion is the epistemological expression of a non-excluded middle action. Both must be thought together in a tie-in with the integrative science theory. But this is a very complex system. It is of great importance for us to realize that we ourselves are contained in the genetic series. So we are determined to have infinitesimal perception or infinitesimal memory in irreversible succession just like the monad.

There is no thought there other than absolute passive thinking. We should ourselves be caught up in an actual entity, namely the most continuous existence, and this is not a reversible, but irreversible continuum. To be caught up in an actual entity means to be free from self-willed intention and to be absolutely passive. We must stand strictly at the place between macro-level as evolutionism and micro-level as genetics.

Nishida's thought as a complex system

As regards differences between western thought and Japanese thought, I have often heard it said that the former is rational and the latter is passive. I think there is little doubt about it: Japanese thinking is very suitable for the study of complex systems.

There are two good reasons for this. One is that Japan is located in the monsoon region, that is, in the border region between the tropics and cold latitudes. The other is that Japanese culture is located in the boundary region between eastern and western cultures. Therefore some people call the Japanese a "borderline nation".

Japanese thinking, as seen above, has had a dual structure and allows for ambiguity as a non-committal attitude. If complex systems are difficult to understand, we could also say that Japanese thought is difficult to understand. The reason comes from the fact that the principle of Japanese thought is applied to the dual structure of the boundary area, and so Japanese thinking is buried deep in these areas and forgotten easily, or it is said to be ambiguous and hard to understand.

So-called "Japanese philosophy" has unfortunately never been valued around the world. The Japanese philosopher Kitaro Nishida named the boundary area a "Place" which, without any intention, keeps us alive and serves as a basis for existence and nothingness under a non-excluded middle action or the simultaneity of Top Down and Bottom Up.

The "Place" is referred to as a "nothingness" (the Formless Void [śūnyatā] "Emptiness") in the sense that there is no "self" as the centre, non-egocentrism in the Place. However, this "Place of nothingness" is very significant as a non-excluded middle action. The "Place with no certain centre" makes it possible for any points of the "Place" to become the centre. There is no centre anywhere; at the same time the centre is everywhere. The passive thinking of being wrapped will be able to allow these contradictory positions.

The “Place” with a simultaneous Yes and No about good and bad, true and false, being and non-being makes it possible for any positions of the place to be non-excluded middle actions. What is in question is not Yes or No, existence or nothingness, but the boundary region, that is, the “interface” of Yes and No, existence and nothingness as non-excluded middle actions.

We should have a lot of latitude to stand in the interface between Yes and No, existence and nothingness. Let us keep an open mind toward Yes and No, existence and nothingness here. There must be the place, namely the boundary area, which means a reciprocal interpenetration as non-excluded middle actions, between Yes and No about good and bad, true and false, friend and enemy, or between existence and nothingness.

This is K Nishida’s so-called “Place of the Absolute Nothingness”. It is exceedingly important to distinguish Absolute Nothingness from a relative nothingness. A relative nothingness is a kind of existence. The reason is that this nothingness is possible only under the prerequisite for an existence. For this reason, Absolute Nothingness means a non-excluded middle action or the simultaneity of Top Down and Bottom Up between existence and nothingness. Nishida called a non-excluded middle action a “contradictory self-identity”.

The mystery means that a thought is stirred in the Place. However, this is the human way of demonstrating its presence or being. In this primal stirring of consciousness, act is thought and thought is act; there is no dichotomy. It is humans who grasp the Primary Place or the Absolute Nothingness by separating thought from act and act from thought as if they were in reality two. The contradiction is not in the Place but in human logic. Nishida says, “Not two but one, and even this one is not to be held up.” The simultaneity of “to be and not to be” is Absolute Nothingness. The contradiction constitutes the human mind or intellect. And it is because of this basic contradiction on our part that we become its victim and turn ourselves into the vessel of self-torture. But the moment we are awakened to it or become aware of it, we are enlightened.

Nishida says that in order to be related with our consciousness and the object, there must be something which wraps both the inside of the boundary region of an existence (=appearance) and a nothingness (=disappearance). Something which wraps both inside is called the “Place”. In the Place the object is wrapped in our consciousness at the same time as our consciousness is wrapped in the object by means of a non-excluded middle action.

The relationship between our consciousness and its object must be called an “Interface” as the Place in a complex system. The place which works as a non-excluded middle action must be something which wraps mutual opposition. Therefore those which change always change to the opposite. Finally, it moves to contradiction and it must be possible to keep it. The true place is not the place of change simply on a horizontal plane, but the place of a birth (or appearance) and a death (or disappearance) from the depths. We are there not to look at those which work simply, but only to look at those which wrap function inside an interface. Genuine pure action is not anything which works toward objects, but must be a non-excluded middle action which wraps mutual functions inside the interface.

Nishida’s “absolute nothingness” is different from an opposed nothingness; it must be something in which “existence and nothingness” are wrapped together in the “integrative science theory”. The place of absolute nothingness, transcending every opposition of existence and nothingness, must be something which is formed inside the interface. It is not to form judgement and to work on an object that we are able to know inside the interface; if anything it must be being wrapped openly in the place. This means that the place becomes the mirror just like a monad.

The reason is as follows. The separation of subject and object becomes non-separation through mutual penetration on the basis of a non-excluded middle action. Non-separation of subject and object results in “nothingness” with the sense that there is no “self” as the centre, or non-egocentrism.

Mainzer's complex system makes use of the framework of "macro-level/ micro-level" in place of the "subject/object" framework from the past, and the category "Top Down/Bottom Up" in place of the past's "form/matter" category. The framework of "macro-level/micro-level" means the "Place of Absolute Nothingness". The category "Bottom Up/Top Down" means a "reciprocal interpenetration" or a "non-excluded middle action".

The ontological concept has fulfilled the function of the mirror which expresses the whole world at any time. Transcending our consciousness, that is fore-consciously, we must stand in the present place to be wrapped in the future and to wrap the past simultaneously. Our consciousness does not wrap the place; on the contrary it has been self-organized from the present place as interface of past and future. What exists truly is not our consciousness but time as irreversible succession. The present means the absolute nothingness which is founded on a non-excluded middle action between past and future.

Nishida especially called this present the "absolute present". The present place is an interface from where our consciousness or new orders emerge continuously. The interface is the place of absolute nothingness, and at the same time the source of creation too.

Then Nishida says that "God" as the "absolute present" is expressing God himself to the end of the world, so all individuals are mirrors of God just like a monad. For this reason, the individual is able to express the whole world as irreversible succession. Therefore we have infinitesimal perceptions or infinitesimal memories as mentioned earlier.

As for our consciousness, it becomes possible to wrap various existences truly only when they can be wrapped in the place. As it is generally very difficult to become aware of this, we cannot manage our own consciousness sufficiently. This is because our consciousness has been influenced to think with the last rationality. However, in the root of our consciousness we can think "nothing", which has force without any constraints. Otherwise we cannot think our free will and the like. In this way, we can be wrapped in the place at the same time as we can wrap the place perfectly.

So there is the place of "absolute nothingness" at the root of our consciousness. We will reach the point where we can perform a suitable expression in ourselves on the basis of the function of the mirror reflecting the whole world at any time. The place of absolute nothingness is not only a basis of our free will, but also a source of appearance and disappearance. In addition the place is similarly a foundation of reciprocal penetration and irreversible continuum, namely "time". The world emerged from time, but time emerged from the place of absolute nothingness.

St Augustine said, "God did not create the world during time, but created the world with time from nothing." When God created possessions from absolute nothingness, time emerged from nothing. Our free will was also created by God from the place of absolute nothingness. The significance of free will does not connote uniqueness in generality; on the contrary it connotes generality in uniqueness, because the basis of free will is attached to the place of absolute nothingness and is something which expresses the whole world in the individual just like a mirror.

Leibniz thought of the "*raison suffisante*" as a principle of will. The conception of Adam contains all the relations between Adam and the whole world. And there is a free will of God under all the relations. Nishida also thought that we have built-in absolute infinite wills under our consciousness. Actual entity is an infinite succession and combination of actions with each other. Our inner experience of these is our basis for free will.

Nishida says, "We can find unity in lack of unity and harmony in disharmony. This is the free essence of actual entity, and an essence of a mental phenomenon is based on unity of contradictions. The two actual entities contradict each other. The deeper two actual entities contradict each other, the deeper two actual entities become real."

He repeats the words of St Thomas, namely “if virtue is known by us, we will do this inevitably”, yet this is not conclusive. A genuine will must be something which transcends this kind of inevitability. The will must be free even from the highest virtue. With this position we are able to reach the polar region namely “to hen” where all good and evil is wrapped. The place of absolute nothingness, where existence and nothingness are wrapped and wrap each other, has made possible a non-excluded middle action or the simultaneity of Top Down and Bottom Up and an irreversible continuum. Moreover their foundation has displayed the free will of a just God. Our free will arises as well from the place of absolute nothingness.

Creation is a self-organization as a representation in the free will of God. “Creation from nothing” (*creatio ex nihilo*) represents God himself in God. As Nicolaus Cusanus says, “God himself is inclusion and development (complication–*explicatio*) of all things.”

So Nishida’s “Place of Absolute Nothingness” has formed a new kind of background to St Augustine’s or Cusanus’s “God”. Here it can look at the contact point of western ideas and oriental ideas in a sense.

Our free will ought to imitate the free will of God. Our will action means limiting itself, transcending logical contradiction, and furthermore wraps this inside. Therefore experiential contents of the will are not anything which is limited by logic, but something which always tears logic. This does not mean that the will is included in reasons; on the contrary, reasons are included in the will. With this meaning, it is possible for our will to transcend any knowledge completely. Our will wraps a “will denial” in the will itself. The consequence is that our will changes to feelings or emotions. Moreover any feelings control themselves naturally here. The reason is that feelings are based upon will denial.

Up to this point we have been considering Nishida’s complex system. An individual (=A) is wrapped in the world of a system (=B), and at the same time B is wrapped in A. To put it briefly, the subsumed relationship between A and B is called a “logic of subsumption” by Nishida. The place of absolute nothingness is characterized as a subsumption.

It signifies our free will action that A is wrapped in B; at the same time it means that our intellectual action B is wrapped in A. Our free will and intellect are constituted and integrated at their reciprocal penetration. There is a good reason that they should be indivisible. We ought to reject a free will without intellect or an intellect without a free will.

In that case a free will emerged from the place of absolute nothingness. In order for our free will to be thought of fundamentally, we should be released from standing on the horizon of self-consciousness. This is Heidegger’s “*Ek-sistenz*”, that is, “to stand in the open place” (*ex-sistere*). But we usually stick to our self-consciousness. It is very difficult to be wrapped in the place by sticking to it.

Our consciousness is after all self-centred. In order to be wrapped in the place we must have a strong will to deny our self-centredness or egocentrism and to control our will positively. If we want to exercise our will truly, we have to get over our self-centredness and train our will soundly. We should stand in the open place of absolute nothingness under any condition. Otherwise there probably are various oppositions in the world.

So we must deliberate on Nishida’s thought about the open place in absolute nothingness as the integrative science theory. The world may have many centres everywhere, but there is no centre of the world anywhere. The place of absolute nothingness is not only a basis of our free will, but also a source of appearance and disappearance. And similarly it is a foundation of reciprocal penetration and irreversible continuum. Our free will ought to be brought up on the foundation of reciprocal penetration and irreversible continuum fore-consciously. Any free will can reach deeper than self-centredness in general, so must come in touch at the place of absolute nothingness.

The original will is a life-force itself and is obedient to the “continuum law” (*lex continui*). A religion forms an adequate concept of real time. Irreversible continuum as a process is religious time. A religion is in striking contrast to a science, for reversible continuum is scientific time. Religious time is irrecoverable at any moment, but by contrast scientific time has a recoverable moment. Free will is formed according to irreversible continuum.

I explained previously that our free will and intelligence are constituted and integrated as reciprocal penetration. If the basis of free will is in religion, the basis of intelligence must be in science, as we generally think. If this is correct, there will be a possibility where religion and science are integrated as a subsumption.

However, it is quite difficult for science and religion to set up a mutual relationship. Science does not concern itself with religion, nor does religion concern itself with science. But the mutual relationship itself is not impossible. The reason for this relationship is not any objectified object; it is a necessary condition to make a system. Both are able to form a system and to come into contact with the place of absolute nothingness.

A relationship B does not mean from subject to object one-way. You may say that the subjectivity = A recognizes the object = B, but it is not so. We ought to say that A is wrapped in B, at the same time as B is wrapped in A. This two-way thought could be matched with a definition of the word “complex” and an “interface” mechanism between A and B. You may not be able to discover the boundary territory in a complex system between science and religion. At the same time, you may lose sight of the place of absolute nothingness. If you do so, you can perhaps focus on an interface of both to subsume a reversible process under an irreversible process. Nishida’s “logic of subsumption” will probably make the mutual mechanism clear. The relationship between science and religion was regarded as a complex system by Nishida.

Buddhist thought and anti-logocentrism

Nishida’s “nothingness” = formlessness or centrelessness makes me remember Heidegger’s “*Dasein*”, because “*Da*” of “*Dasein*” suggests that there is no “subjectivity” as the centre of the world. If anything, “*Da*” means the “interface” between subjectivity and the world. Heidegger’s “*Sein*” and “*Existenz*” are regarded as “*In-der-Welt-Sein*”, in which there is no “self” as the centre. I think Nishida and Heidegger hold the same viewpoint of passive thinking being wrapped in a complex system. Nishida says that an “individual” is kept alive in the “Place”, namely “the absolute present” as interface between past and future, and Heidegger thinks that our “existence” is thrown into the world (*die Geworfenheit*).

Late in Heidegger’s life “*Existenz*” was called “*Ek-sistenz*”. The “*Ek*” of *Ek-sistenz* means to stand outside of subjectivity, that is to say, to escape from the individual into the open world. The whole is open into deepness of being (*die Offenheit des Seins*). We only realize our existence when we are thrown into the world. Heidegger named this realization “*existenziales Verstehen*”.

The individual is wrapped in the world, and the world is wrapped in the individual. The individual is not the centre as subjectivity, because the individual is wrapped in the world and at the same time the individual is the centre of realization that it is wrapped and simultaneously wraps the world. That is to say, the individual wraps the whole world as “*existenziales Verstehen*”.

Here the interface between the whole world and the individual is a key concept. There is no law of excluded middle. Following the law, we can never overcome the contradiction that the individual can be the centre and at the same time not the centre, or that the individual is wrapped in the world and at the same time the world is wrapped in the individual. The interface takes on the

character of a contradictory self-identity as a non-excluded middle action or the simultaneity of Top Down and Bottom Up.

Such views are possible only in the passive thinking of being thrown into the world which does not follow a form of formal logic. Almost all past philosophers were thinking in accordance with rational epistemology or logocentrism and based on the law of excluded middle. On the other hand the passive thinking of being wrapped is against the law of excluded middle and in this sense follows an irrational “integrative science theory” as a contradictory self-identity. This way of thinking should be referred to as “anti-logocentrism”.

As individual existences we are karma-bound and therefore sinful, for karma is inevitably connected with sin or vice according to Buddhism. As no karma-bound beings are capable of effecting their own emancipation, they have to take refuge in “the Place of Absolute Nothingness” which is ever extending its helping arms. This being so, all that is needed of us is simply to remain altogether passive towards the Place of Absolute Nothingness. This means the passive thinking of being wrapped. “Self-power” is logical, that is, logocentrism and therefore intelligible, appealing to ordinary minds, but the “other-power” is altogether irrational, and the fact is that this irrationality, namely anti-logocentrism, makes up human life and is “natural”.

“The Place of Absolute Nothingness” is the “Pure Land of Buddha” for Buddhism. Once Daisetz Suzuki wrote about Shinran’s thought as follows (this thought, as passive thinking or “other-power”, still continues to exert a potent hold on millions of people in Japan:

The most significant remark which may be made here is that Shinran has his characteristic way of reading the Chinese passage containing the characters 至心廻向, “to turn towards ... in sincerity of thought”. “To turn towards whom” is the question here. Ordinarily it is for all beings to turn towards Amida as Ultimate Reality and direct all their stocks of merit towards their rebirth in his country, and no doubt, from the literary point of view too, this is the correct reading. But Shinran reverses the customary way of reading and makes Amida turn all his accumulated merit towards opening the passage for all beings to his Pure Land— where lies the essence of the tariki (other-power) teaching. That we are assured of our rebirth in Amida’s Land is not by any means due to our own merit but to Amida’s unqualified love for us who in no circumstances by ourselves can work out our own salvation.

According to Shinran, we can never work out our own salvation by ourselves, because to work it out is to contrive, to calculate, to lay down a plan, to have an intention. He has consistently disavowed this. The reason why we can never work out our own salvation by ourselves is because we ourselves are not wrapped in Amida’s Land. To put it simply, we have not the passive thinking of being wrapped. In order to work out our own salvation it is not possible other than with the thoroughgoing passive thinking of being wrapped. Only this thinking, being the deep-minded, is able to find Amida’s Land.

Open-mindedness is believing deeply in Amida’s Land, deep faith is resolute and resoluteness is the mind that knows nothing deeper than itself. We can say with resoluteness that we are wrapped in the Pure Land as Ultimate Reality, and at the same time the Pure Land is wrapped in us. Even if the Pure Land were wrapped in us, we must make all possible efforts to find it. Resoluteness is living this life of karma and at the same time the transcendent life. The upshot is that the resoluteness is living in the interface between the earthly life and the transcendent life.

Again Suzuki once wrote:

The Shinran’s idea of “merit-transference” (*parinama*) is in direct opposition to the general Mahayana idea of it. In the latter, merit created anywhere by any being may be turned over to any other being desired

or towards the enhancement and prevalence of Enlightenment in the whole world. A Bodhisattva practises asceticism not only for the perfection of his own moral and spiritual qualities but also for the increase of such qualities among his fellow-beings. Or he suffers pains in order to save others from them and at the same time to make them aspire to Enlightenment. Merit-transference has thus also the nature of vicarious atonement.

With the Shinran, however, the source of this activity lies with Amida as Ultimate Reality, and from Amida alone as the centre starts the spiritual vibration known as merit-transference. This is the fulfillment of his Original Vow. According to Shinran, the transference starts from Amida to all beings and not from all beings to the realization of enlightenment. When this merit-transference is made to originate exclusively from Amida, we see where the idea of *tariki* (other-power) comes from. We can almost say that the entire structure of the Shinran's teaching is dependent upon his interpretation of the principle of merit-transference.

His interpretation comes from the interface between the earthly life from the past and the transcendent life of the future. The interface is in his resoluteness and his basis in anti-logocentrism. We may say that three lives, namely the earthly life as the present, the life of karma as the past, and the transcendent life as the future overlap each other in the interface as "the absolute present" of Nishida's thought. The two lives of the earth and karma are based on self-power, and active "self-power" is logical and therefore intelligible, appealing to ordinary minds, but the transcendent life is based on the other-power, and the passive "other-power" is altogether irrational and passive thinking; in other words, a position of anti-logocentrism.

It is of overriding importance today that we realize this irrationality makes up human life. Meaningful anti-logocentrism is not generally realized. Conventional science and philosophy have depended only on "self-power" without noting the significant "other-power". To think the "other-power" deeply, we must get into the habit of passive thinking. Passive thinking means standing outside subjectivity, that is to say, escaping from the individual to the whole world. I repeat that this is "*Ek-sistenz*", the "*Ek*" of *Ek-sistenz* meaning that we are standing in the transcendent life and the whole is open onto actual entity (*die Offenheit des Seins*).

We only realize our existence when we stand in the whole world. Heidegger called this realization "*existenziales Verstehen*". The individual is wrapped in the whole, and the whole is wrapped in the individual. The individual is not the centre as subjectivity, because the individual is wrapped in the whole, and at the same time is the centre of realization, because the individual wraps the whole as "*existenziales Verstehen*".

The above is my interpretation of the passive thinking of Shinran. This train of thought means to be free from self-willed intention. Our free will is not to exercise self-willed intention but to have trust in the Original Vows and to be absolutely passive in the hands of Amida as the Ultimate Reality, who has prepared for us the way to his Pure Land, namely the Place of Absolute Nothingness. Self-willed intention, that is, "self-power", is logical and therefore intelligible, appealing to ordinary minds, but the passive thinking of being wrapped, namely "other-power" is altogether irrational, and the fact is that this irrationality makes up our human life. To live in this world is to live this mystery. This is known as being "natural", following the course of things, especially of the spirit. We ought to take things as they are, in the world arranged by the Original Vow of Amida as Ultimate Reality.

Conclusion

What is the principle of integration in various sciences? We have lost sight of a connection between our thinking in sciences. How should we connect the natural sciences to the humanities? We have

not understood the thread of philosophical thinking to complex systems. The “interface” of two sciences is, to my way of thinking, the most important part of the problem. The interface is a complex system that cannot be made clear logically. We should especially not think with the law of excluded middle. If anything, we must think with the integrative science theory. This theory will make system science come true. That is not all. It will change our awareness.

Now boundary areas between some ethnic groups or religions are extremely complex. Rational thinking is not good enough to overcome this chaos and complication in the world. Rational or logical dialogues cannot solve the problems of today, and it goes without saying that military power can never be the solution.

Today is the time to transform our thinking. Our innovative thought should be based on the “integration of contradiction” as excluded middle action, which allows the thought that “there is a centre, and at the same time there is no centre”.

My thinking as “anti-logocentrism” consists of an “integration of contradiction” between being wrapped and simultaneously wrapping, and this integration is what I call a “global identity”. Integration of contradiction seems to be more difficult in Europe than in Japan. Facing the contradiction that each nation is the centre of the world and at the same time is not the centre, we must change our awareness according to excluded middle action.

If “integrative science” comes to fruition, not only Europe but also the Middle East, Africa and Asia will be integrated, because each country is not the centre of the world, because each country is wrapped in the world, but at the same time is the centre, since each country wraps the world. Integrative science is just what will bring about a realization of “global identity”. I believe the new civilization will come in due time.

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