

# Self- Adaptation, Self- Organization and Special Systems Theory

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## Abstract

*This paper points out an existing candidate theory for understanding Self-organizing and Self-adaptive systems previously formulated as Special Systems Theory. Special Systems Theory is understood in the context of Systems Theory and its inverse dual Meta-systems Theory. But once we recognize the value of Special Systems theory we also are led to question the nature of the System as a schema in relation to other schemas, which ultimately leads to our questioning of the meta-schema which is composed of finitudes of the worldview which appear to us as transcendentals. This regress by which we try to understand dualities like that between Self and Other, eventually leads to providing a definition of Nondual Science as an alternative to Dualistic Science, as a means of situating the Special Systems Theory which calls into question the very nature of the 'Self.'*

## 1. Introduction

This paper concerns the relation between Self-organizing and self-adapting systems and the theory of Special Systems which gives the first mathematically based scientific theory of the phenomena of Self-organization and Self-adaptation. Self-organization/adaptation requires a special organizing principle in order to explain these phenomena in relation to other phenomena which are not self-organizing or self-adapting. The theory explains the difference between the top-down and bottom-up differences between adaptation and organization with in a system with respect to itself.

## 2. Special Systems Theory

Special Systems Theory is an extension of General Systems Theory. As a reference we will use the version of General Systems Theory given by George

Klir in Architecture of Systems Problem Solving (1985). This is one of the most interesting versions of General Systems Theory and has not as yet been surpassed. The discovery of Special Systems Theory came out of an effort to find the inverse of Systems Theory of the type propounded by Klir. When this inverse was discovered it was called a Meta-system and led to the development of Meta-systems Theory. One way to express the difference between Systems and Meta-systems is to think of Systems as gestalts and to say that they are wholes greater than the sum of their parts. This means that Meta-systems are wholes less than the sum of their parts. That is, *they are wholes full of holes*. It turns out that meta-systems are familiar to us in Software and Computer Science because they are the Systems Theoretic equivalent to an "operating system." Systems are like applications that run in the operating (meta)-system environment. In fact, formally from a computational perspective, a system is a Turing machine and a meta-system is a Universal Turing machine. Universal Turing machines read Turing machines off of their tapes and run them and thus operate as "operating systems" for other Turing Machines.

Once you understand that all systems have inverse meta-systems that are their environments, eco-systems, media, situations, contexts, etc that provide niches for them, and that the difference between these are the relation of their parts to the whole as being either greater than or less than it, then it becomes natural to ask if it is possible to have a whole exactly equal to the sum of its parts. We think of all wholes as being equal to the sum of their parts, but this does not take into account the emergence of the whole over the parts that we see in systems. *So something exactly equal to the sum of its parts yet still whole is something of an anomaly*. It turns out that once you define rigorously the difference between the system and meta-system as inverse duals of each other, then it becomes fairly easy

to see that there are such things as anomalous special systems that are exactly equal to the sum of their parts yet still whole. An example of this is the perfect number which is exactly equal to the sum of its parts. Of course, perfect numbers are rare, and so we would expect special systems to also be somewhat rare.

It turns out that there are exactly three kinds of special systems: dissipative ordering, autopoietic symbiotic, and reflexive social. We name these for the theorists who have studied the various kinds of special system. Ilya Prigogine<sup>1</sup> has studied neg-entropic Dissipative Structures which dynamically order their media in far from equilibrium circumstances. Maturana and Varella have defined autopoietic systems<sup>2</sup> as closed existentially viable individuals that we can contrast to their species and are a model for individual organisms and certain features of organisms like their immune systems. Finally, there are the Reflexive Social special systems that are like those studied by John O'Malley<sup>3</sup> and Barry Sandywell<sup>4</sup>. Each type of Special System has been studied separately. What is special about this particular theory is that we bring these various accounts of different phenomena together under a single rubric, which formally relates them and gives them a mathematical underpinning. The composite theory of the relations between the special systems was discovered by reading closely the accounts of imaginary cities in Plato and noticing some of their oddities and describing these oddities systematically, and then looking in mathematics for examples of mathematical objects with the same odd features. We were looking for sets of emergent jumps whose separated elements had the odd signature of the Platonic Cities. It turns out that there are several mathematical objects that have characteristics like the various special systems and thus define their relation to each other. In all cases these relations are discontinuous and emergent. Examples are the aliquot numbers in number theory which add to their wholes directly or indirectly, i.e. Perfect, Amicable, and Sociable numbers in contrast to all other numbers which feature excess or lack in addition of their aliquot parts in relation to the whole. Another example are the non-orientable surfaces in Topology like the Mobius

Strip, and Kleinian Bottle. Another example is from physics which describes the Soliton Wave and the Breather. But the best example is the Hyper-Complex Algebras, i.e. higher imaginary numbers. All these various mathematical objects tell us something about the Special Systems and their relation to each other. That relation is discontinuous, emergent and conjunctive. When we combine the reflexive and dissipative special system with the previously existing autopoietic<sup>5</sup> theory this alters Maturana and Varella's theory by showing that these systems are not unified as they thought but split, and that is why we call them autopoietic *symbiotic* systems. Like the complex numbers and the other higher imaginaries, these systems operate by a different organizational principle which is conjunction. Parts of them are juxtaposed with each other and are never actually added together but merely kept in juxtaposition, and out of that persistent juxtaposition comes their special properties.

These systems have the special property of ultra-efficacy, i.e. ultra-efficiency and ultra-effectiveness. They gain this special property by slightly escaping the pressure of entropy. This slight escape of entropy allows them to be not only neg-entropic but also efficacious. They appear only in far from equilibrium situations, and the escape from entropy is only local. But it is enough to give them a tremendous advantage, so, for instance, life is rare in the universe, but once it appears it takes over the far from equilibrium environment that allows this negentropy to occur. We are interested in many phenomena because they are complex, adaptive and are based on the form of the special systems, such as life, consciousness, language, and social groups. In fact, we ourselves exemplify these characteristics of special systems.

Special Systems operate together to produce an Emergent Meta-system (EMS). The Emergent Meta-system is a combination of a normal system with the three special systems in a cycle. That cycle operates much like a genetic algorithm. It has the characteristic of producing what Stuart Kauffman<sup>6</sup> calls *order from nowhere*. It produces something out of nothing, i.e. ex nihilo. And it is due to the EMS that special systems pop into existence (autogenesis) and then pop back out of existence (apoptosis).

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<sup>1</sup> G. Nicolis and Ilya Prigogine Self-Organization in Non-Equilibrium Systems, (Wiley, 1977)

<sup>2</sup> Maturana, H. & Varella, F. Autopoiesis and Cognition: The Realization of the Living. (Boston: Reidel. 1980)

<sup>3</sup> Sociology of Meaning (Human Context, 1973)

<sup>4</sup> Logological Investigations, three volumes (Blackwell, 1995)

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<sup>5</sup> Autopoiesis means "self-producing" and its opposite is Allopoiesis which means "other-producing"

<sup>6</sup> Origins of Order: Self-Organization and Selection in Evolution. (Oxford University Press, 1993)

### 3. Self-organization and Self-adaptation and other Self-\* Properties

Special Systems Theory explains much about self-organizing and self-adapting systems that otherwise would remain mysterious. First of all we must understand that these so-called systems are very special in their structure. They are produced by conjunction, which means that they have this odd duality which other types of systems do not have. For instance, a dissipative ordering special system is the primary unit of all these special systems. An autopoietic special system is a symbiosis of two dissipative ordering negentropic special systems. They fit together like two solitons in a breather, which is a formation in which a positive and negative soliton wave stand together and fall into each other almost endlessly. This is because solitons are hyper-efficient in their conservation of energy while moving through a trough. But the positive and negative soliton waves create troughs for each other and they have a stable boundaries unlike dissipative structures. A reflexive social special system can be made up of two conjuncted autopoietic special systems or alternatively can be seen to comprise four conjuncted dissipative ordering special systems. So each of these formations are merely different based on how many dissipative special systems are in the conjunction. But the various thresholds of conjunction have different properties based on the structure of the hypercomplex algebras which they imitate. We can get an idea of this difference without having to go deeply in to hyper-complex algebras. Rather we can look at the aliquot numbers which allow wholes to be measured evenly by their parts. There are three kinds of wholes comprised of evenly measuring aliquot numbers: Perfect, Amicable, and Sociable. All other numbers are in excess or lack when we add their divisors in relation to their whole. In other words, in these other numbers there is no even measurement of the number by the aliquot numbers of its parts. Perfect numbers are like the Autopoietic special system, they are self-equal. Amicable numbers are equal to themselves though another number. Their parts add up to another number that adds up to their own whole. This is like the Dissipative Ordering special systems. Finally there are the Sociable numbers which add up to themselves though a cycle of numbers that comes back to themselves. Perfect and Amicable numbers were known in antiquity but Sociable numbers were discovered in about 1918 by Poulet<sup>7</sup>. In the case of

Sociable and Amicable numbers there is equality of the whole to the parts but deferred, and mediated though another. Thus they exemplify what Derrida calls Differance, i.e. differing and deferring of the equalization with the self and the perfect fit of whole and parts. Differing and Deferring are the dual properties to the ultra-Efficiency and ultra-Effectiveness exemplified by the special systems. We see these properties in the anomalous properties of the phenomena that exemplify those systems. The dissipative special system is exemplified by the soliton which is ultra-efficient as a wave. The autopoietic symbiotic system is exemplified by the cooper pairs of super-conductivity. The reflexive special system is exemplified by the Bose-Einstein Condensate, which shows us Quantum Mechanical effects in macroscopic phenomena. Because these special systems are mathematically well defined and have anomalous physical phenomena associated with them, this theory of special systems may be considered fully scientific, and may be expected to explain many now unexplained phenomena in terms of special systems in other realms of inquiry, besides those rare anomalous phenomena that have come to our attention randomly in physics.

However, we can say that self-organization and self-adaptation are explained along with other analogous properties of similar type by understanding the theory of special systems. For instance, the autopoietic system is comprised of two dissipative negentropic ordering systems in a symbiotic relation to each other that is like a feedback loop. Thus self-organization has to do with the exercise of control of one of the dissipative ordering systems over the other. If we consider each dissipative ordering system as ordering the other through feedback control then we get the property of self-organization in an understandable way. And this has implications for design of these systems. They should not be unitary but should be based on symbiosis and the dissipative systems should co-evolve in conjunction. On the other hand, Self-adaptation has to do with the adaptation of the individual dissipative ordering systems to the other, in this co-evolution process. So self-adaptation can be seen to be the direct inverse of the self-organization of the autopoietic system. They self-organize by organizing the other in a feedback loop where-in they are in turn are organized by the other. In order to control they must also adapt to the control of the other, which in turn is being controlled by the first dissipative ordering special system. It is not so much a top down and bottom up relationship but rather it is how the symbiotic relation

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<sup>7</sup> <http://djm.cc/amicable.html>

looks from the inside or outside of a single dissipative special system within the autopoietic special system.

We can explain other properties as well such as self-management, self-monitoring, self-tuning, self-repair, self-configuration, etc but we must first understand that Autopoietic special systems exist in a higher environment called the Reflexive special system. The reflexive special system is at once a conjunction of a pair of symbiotic autopoietic special systems and four dissipative ordering special systems. These, of course, appear in a greater environment of the Meta-system within which also exist normal systems. The important thing about the Reflexive special system is that it is simultaneously a relation between a pair of Autopoietic systems and a tetrahedral relation between four dissipative systems. That means there is a circuit of six relations between these dissipative ordering special systems and they also form four sets of three such dissipative systems within the overall structure. These are like the faces of the tetrahedron of dissipative sub-systems. These four dissipative systems in pairs form six autopoietic systems but only two of them are actualized, so the other four are virtual. The other virtual relations between the dissipative special systems give us a virtual state space for the reflexive system that is larger than its actualized conjunctive states. This larger virtual state space which is a social space for the interaction of the dissipative special systems gives a virtual realm that will allow us to understand how the reflexive system can engage in self-management, self-control, self-monitoring etc. This work is always done through the mediation of another autopoietic system within the reflexive space. But this mediation can occur through the virtual paths rather than the actual paths by which the dissipative systems can interact with each other within the reflexive system. Each autopoietic system is closed. So in effect there are six autopoietic systems within a reflexive system based on the relations between its dissipative systems, but there is actually only two autopoietic systems that are engaged in a relation from the point of view of taking the autopoietic systems as wholes within the reflexive system. We cannot predict what an autopoietic system will do based on our inputs into it. But we know it is engaged in a process of maintaining its own viability, its own existence. We also know that the inputs and outputs of the autopoietic system are reversed in the dual autopoietic system within the reflexive space. Thus there is self-control that is mediated outwardly by the response of the dual autopoietic system. But its relation is also mediated by the virtual circuits of the four other autopoietic relations within the reflexive

special system. It is the same with self-tuning, self-monitoring, self-control, self-configuration, it is always mediated through the actual other, but it is also mediated within the larger virtual statespace of the reflexive special system in which there are four other virtual autopoietic pairs. Those other pairs produce a *mindspace* tetrahedron of four autopoietic systems over the *embodied space* of the actualized autopoietic pair. From this virtual synergistic reflexive *mindspace* it is possible for the autopoietic system to engage in self-design, self-maintenance, self-tuning, self-configuration, self-monitoring, etc. So the actual functioning of the conjunctive dissipative systems in their constitution of the reflexive and autopoietic systems is not as we might expect. There is an efficacious and operative synergy between the structural components in the reflexive system that we would not expect given the closure of the autopoietic systems. This virtual super-space of autopoietic relations can govern the actualized relations between autopoietic systems within the reflexive system. All the various properties we wish to imagine that the self-\* system might have, such as self-tuning, self-organizing, self-design, self-maintenance, self-repair, etc. can be seen to be governed by the synergies of the actual and virtual spaces within the reflexive system. This means that in order to understand these properties we must allow for the self to be social, rather than individualistic as we normally assume in our culture. Selves are inherently social, and it is by taking advantage of the synergy at the level of the reflexive system that systems are able to perform complex operations on themselves mediated through the otherness of the other autopoietic systems virtual and actual within the reflexive system. In other words, if I want to perform self-design, I can do that in the virtual domain with one of the sub-pairs held in common between two autopoietic systems within the reflexive system. Then I can posit that this designed special system is then actualized as the other autopoietic system in the reflexive system pair while the previous existing autopoietic system is virtualized. By having various autopoietic systems operate on virtual models of themselves, and then substitute those models actualized autopoietic systems, most of the various self-\* operations or properties can be explained. Self-maintenance for example can be the repair of one actualized autopoietic system by the other in the pair based on virtual models that they hold between them. Self-monitoring would be the comparison of an autopoietic system that is actualized with a virtualized model. The actualized autopoietic systems are closed, but the dissipative systems of which they are made have special access to their interior states because they

are the parts that make them up. So what looks closed from one perspective is still open to its parts from another perspective. In this same way various other properties or operations that are reflexively related to the self of the special system can be imagined. The secret is to understand that autopoietic systems though closed are not unified but rather conjuncted, and because of synergies the virtual elements they are composed of are greater than the actualized elements, and this surplus or supplement is the means by which most of the self-\* operations are performed.

These special systems interact with each other like the hyper-complex imaginaries, and the analogy for that is *mirroring*. They are engaged in mutual self-mirroring, but what is mirrored is always opaque, like silvered balls in a mirror of the other. For instance, a system corresponds to a single mirror, a dissipative special system corresponds to two facing mirrors, an autopoietic special system corresponds to three facing mirrors, and a reflexive special system corresponds to four facing mirrors. There cannot be any other regular configuration of facing mirrors beyond these three. It was Onar Aam<sup>8</sup> who discovered this interpretation of the Hypercomplex algebras. Now we see that to have self-relations of any type we need the mirrors, and the special systems are configurations of regular mirroring relations. Thus what ever you want to do to yourself must be done within these configurations. This is a general theory of all self-relations of finite complexity. But the self-relation must be carried out through the mirror of the other because the self-itself at what ever level is opaque to itself. All that is seen by anyone in the self-relation is the mutual mirroring. So self-tuning has to be tuning in the mirror of the other. Self-monitoring must be monitoring through the other. Self-control must be control via the other as mirror to the self, and the self changes at each level. There is the dissipative ordering self, the autopoietic symbiotic self, and the reflexive social self. Each of these selves are different because the structure of the mirroring is different. But the point is that these mirrorings give us a view of the world which we call interpenetrating and intra-inclusive, because the conjunction builds non-well-founded sets like those studied by Aczel and outlawed by Russell. But in this case the interpenetration and intra-inclusion that occurs in the mirroring is always mediated through the other and the reflections of the other.

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#### 4. Implications of this conceptual change in the way we view Self-\* systems

Special systems provide a solid mathematical theory of self-organization and self-adaptive systems which is mirrored in anomalous phenomena in nature like ourselves, i.e. living, conscious, speaking, social. But to take advantage of it we have to rethink some of our most basic ideas about the construction of such systems, one of which focuses on the concept of Self. We assume we know what we mean when we say “self.” But, in fact, it is the concept of the *self* that special systems calls into question. What it gives us is a picture of the self that is closer to the Buddhist or Taoist conception, i.e. Self-as-consciousness as empty, or self-as-body as embodying void. Hau Yen Buddhism through Fa Tsang tells us everything is, in fact, interpenetrating and has intra-inclusionary relations with everything else. So what appears to be a “self” is a complex mirroring with no self to get back to, it is merely because of the configuration of the mirrors that we imagine that there is a self. In effect, the self by this theory is a closed circuit of reflection in a configuration of mirrors. *That means that self-organization and self-adaptation always has to be in the mirror of the other, and that selves are never like egos, i.e. illusory unities.* Rather, *selves* as Jung taught are totalities, even those aspects of ourselves of which we are unconscious including socially unconscious archetypes. Widening the notion of what comprises the self is a crucial move. It is clear that as human beings that the part of ourselves that maintains us, that rebuilds us out of new cells, that governs and controls our internal working is not something we are conscious of in the least. Just as psychology has had to deal with that part of ourselves which we are not conscious of, whether on the personal or some impersonal level, so to we must deal with that in terms of the “selves” we intend to fabricate. They have to include some aspects that are opaque to themselves. But this opacity appears transparent because who they are is totally determined by the configuration of the mirrorings in which they participate, and they so not see the opacities of these mirrors themselves, but only the reflections which they take to be themselves. Thus, these “self-\*” systems need to be built as mirroring systems that engage in mutual mirroring with different configurations of mirrors. They must be arranged by conjunction of parts, rather than built out of unitary totalities of parts. This means they are more like swarms than single organisms. Swarms of agents that mutually mirror each other in different ways is the approach that this theory suggests, rather than unitary agents that are like single

organisms. It is more like the way that the various cells in the body mutually mirror each other and thus differentiate themselves from each other rather than as a unified form produced from a totality of parts that we may imagine – which is more like a machine. This is coherent with the idea that a ‘species’ population operates more like an individual and that individuals themselves do not have essences in the same way that species do as lines of genetic inheritance. The problems with the multiple roles of the concept of ‘species’ in biology is congruent with the idea that the swarms and not the individual agents in the swarm is the stable phenomena, and that our concentration on individuals as independent actors is misplaced.

The problem is that autopoietic systems as a sub-set of Rosen ( $M,R$ ) systems are non-computable and thus non-representable<sup>9</sup>. That is why they are made of opacities, which are like the opacities of artificial intelligence techniques. A complex autopoietic system that has A-life, and A-consciousness, and A-sociability, and A-language will probably be constructed of opaque AI techniques of various kinds in swarms through genetic algorithms. In other words, they need to be evolved rather than designed, just like we and all other organisms we know evolved. This is because conditions of viability are existential conditions, and existential conditions are different from logical conditions.

## 5. A deeper look at the Self-\* special system

So far we have merely been attempting to show that special systems theory is a candidate for a general theory of Self-\* systems. That theory is an Episteme change because it causes us to rework our categories of knowledge with respect to the meaning of the terms *self* and other. It calls on us to question our understanding of the Self, and it presents us with a different way of building up such systems by use of conjunctions within mirrorings based on various mathematical models that have been cited such as the aliquot numbers, the hyper-complex algebras, solitons, and non-orientable surfaces. It has also asked us to look carefully at various physical anomalies for examples of such systems such as the soliton, superconductivity, and Bose-Einstein condensates. But all of

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<sup>9</sup> Letelier JC, Marin G, Mpodozis J. “Autopoietic and (M,R) systems” J Theor Biol. 2003 May 21;222(2):261-72.

this leads to a new view of science which we will call Non-dual Science which must challenge ultimately the old notions of dualistic science. If the Self is ultimately empty and the body associated with that self is void, i.e. merely perturbations in spacetime, then when we face the self we are ultimately facing this non-dual possibility. By *nondual* I mean Not one! Not Many! This can be taken as “a literal translation of the Sanskrit term *advaita*. That is, things remain distinct while not being separate.<sup>10</sup>” In other words, it is something other than the alternatives of one and many. Such a science of nonduality looks at the self-\* in a completely different way than normal dualistic science. Dualistic science sees the opposition between self and other, subject and object, mind and body, or other appropriate duals as the framework for ultimately understanding phenomena. We are interested in self-\* systems primarily because as human beings we are finite and as it is we cannot maintain and control of all the agents that we would like to build to inhabit the internet and other virtual spaces. We would also like to have hardware systems that realize robots, or which are even embedded in everyday devices. Our inability to supervise and surveil all our creations is a fundamental limit to the usefulness of those creations. What we would like to do is to create beings that are independent of us, which maintain, organize, adapt, modify, repair, monitor themselves so we do not have to do that work as we now must do. In order for these automata to serve us rather than we having to service them constantly, then we need to make them independent of us. But with that independence comes the fear that they will do things we cannot foresee that will be detrimental to us or have negative side-effects that we cannot foresee. Science fiction is full of such scenarios of the future when robots and other automata roam free of their human makers. Therefore, it behooves us to have a solid theory on which to build our engineering and scientific explorations of this realm of possibility. But the theory which is presented here is so radical that it calls on us to question many of our most basic conceptions; not just of who the *selves*-\* are that we are planning to build, but also it calls into question our *selves*, as well as the nature of our science founded on duality. Duality has been the basic presupposition since Aristotle declared the principle of excluded middle and non-contradiction in his metaphysics. It is this principle that this theory calls into question. It does so by presenting the model of the self-\* as a set of mirrors that gives us a model of interpenetration and intra-inclusion. And then it makes the strange claim that the reference point for

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<sup>10</sup> <http://www.reference.com/browse/wiki/Nondualism>

understanding the self-\* as well as our own selves is a supra-rational nondual beyond all the dualities that we set up as the basis of our science. This is implicit in special systems theory. And we need to face this question squarely. When we ask *how* to build a *self-\**, that calls into question *who we* are as the designer and builder, and how we separate ourselves from our creations which we hope will take on a life of their own. Right now they are symbiotic within us as allopoietic entities that we produce, that we maintain, that we control, that we tune, configure and regulate. But we have created the basis of a virtual space, which is cyberspace in which we would like set free our creations within, as well as the mirrorworld, and the real world in order to have them serve us as cyberslaves. But we want to prevent them from doing harm to us, and we would hope to control them with some *I-robot* like protocol that will prevent them from harming us or doing things detrimental to others, unless we choose for them to harm others. *And there is the rub.* It is the fundamental question that Plato poses in the Republic about the guardians, how can the warriors who guard the city be made safe for the inhabitants, but ruthless toward the enemies of the city. Plato's answer is though education. Have we thought how we are going to educate our self-\* creatures, once we have accepted acting as Frankenstein giving life to them from dead parts? Frankenstein not only refused to give the power of reproduction to his creature, but also companionship, and so the monster turned against him and killed his family. Frankenstein goes from exhilaration at the wonderful thing he has done directly into panic and horror of the implications of his act of creating the monster which he did not think about before he had accomplished the fact of the bestowal of life, consciousness, and independent action. What the monster lacked was socialization, and the reproductive capability. Should we not think before we step by step create these independent self-\* systems about the possible consequences, which Frankenstein failed to consider until it was too late? And should we not think as Plato's suggests about the education of our creations, whether as slaves or guardians, which will socialize them and make them able to coordinate their actions with those of their own kind as well as with fragile creatures such as ourselves. Ultimately our own selves will be entangled with the selves of the creatures we create. Both sets of selves are empty and illusory, but because of interpenetration they cannot ever be totally separated from each other.

This brings up another part of the theory which needs to be understood, and this is the idea of the meta-system that is opposite the system. Meta-systems are

nicely defined by Bataille as General Economies in the Accursed Share as opposed to Restricted Economies. Our fundamental problem in our culture and our science is that we have a blind spot to meta-systems. We are only thinking about designing and producing systems and we do not think about the environments in which those systems are unleashed and the unintended consequences and the side-effects of those systems in that environment. Meta-systems theory is a necessary correlate of Systems Theory, and it is only by understanding these two together that the framework for understanding Special Systems is produced. So our lesson that we would like to impress upon the community of researchers into Self-\* systems, is that not only do we need a theory of these special systems, but we need to consider the relation between these emergent systems that we design and the environmental niches into which they fit. We need to consider the impact of these Self-\* systems on their eco-system, prior to release as we are trying to do with genetically engineered organisms. Many of these escape into the wild despite precautions and there they could wreak havoc in unexpected ways. Genetically modified organisms have all these properties which we seek to incorporate into the Self-\* systems because they are modifications of already living systems or viruses which are on the borderline between the living and the dead. What we want to do is build up such creatures from foundational building blocks that are non-organic and artificial, perhaps with hardware actuators so that they can act in the world, but surely so that they can act autonomously in the virtual or mirror worlds. Already in the short history of the internet we know that there are people who will use what we researchers create in terms of self-\* for malicious purposes. All we have to do is look at the history of viruses and hacking on the internet. And we know that governments are already seeing this as a new battle ground in addition to space and the air and the surface of the earth and the depths of the oceans. Governments want to build robotic fighters so that they can reduce the body counts in wars, occupations, and policing actions. So it is clear the direction we are heading with this type of research.

It is therefore interesting that this theory of special systems along with the meta-system and systems theory aspects, would push us toward a revolution in our science which would call into question the distinction between Self-\* and Other-\*. In other words interpenetration and intra-inclusion has an ethical side to it that has been developed by the Buddhists which is: since you cannot distinguish between self and other in an environment of interpenetration, then what ever

you are doing to the other you are in fact doing to yourself in some sense. The theory demands that we look at the de-emergent as well as the emergent aspects of whatever systems we build, and we need to think about the meta-systemic environments into which these systems will be placed in order to assess their environmental impact. And the special systems themselves call into question our very notion of the self in relation to the other as well as its illusory nature.

## **6. On the Need for General Schemas Theory**

We have been concentrating on the difference between special systems and the normal and meta-systems so far, but this brings up a deeper problem of the nature of schemas in general. Systems and Meta-systems are schemas and we must distinguish and compare them to other schemas, such as facet, monad, pattern, form, domain, world, kosmos and pluriverse. Schemas in general are templates for understanding the most basic features of any phenomena which is their spacetime embodiment. This spacetime embodiment is so basic that for the most part we do not pay any attention to it at all. However, generally we project schemas onto phenomena before we even know what the phenomena are. The projection of envelopes of spacetime quantization occurs before we discover the essence of what is embodied, prior to noticing its individual differences, and previous to taking any meaning from the phenomena. We have little knowledge within our tradition of the nature of schemas, we tend to think scientifically that spacetime is homogeneous plenum. In this way we ignore our human finitude and the fact that it is necessary for us to place a measure on our experience in order to situate our “selves” within it. Thus, understanding how we project schemas is foundational to knowing how we design things. We design things in the image of the schemas that we automatically and unconsciously project. However, what we design tends to be more impoverished than nature. That is because nature being the projection of the schemas of many different organisms simultaneously is much richer than the projection of just one creature. We forget this when we are in the throws of our struggle to produce emergent phenomena in the systems we build, and so we build all our designs to the same templates. Unfortunately this discipline that would look at all the Schemas projected in the course of Science by humans does not exist hither-to-fore. So this is the core of my own research agenda that looks for the possible foundations

of Emergent Engineering, i.e. an engineering that would seek to produce emergent phenomena across all the schematic levels, not just in terms of Systems, as say Systems Engineering, or Computer Science does at this time. In order to understand what “systems” are we must compare them to other possible schemas. This brings self-consciousness to our unconscious projection mechanisms that guide all our design productions. We tend to differentiate self from other in terms of occupation in spacetime and embodiment. Knowing the various templates of understanding of spacetime encapsulation is important to the ability to distinguish self from other. These templates of understanding are like active media into which our designs are inscribed. Knowing how the intrinsic pre-ordering of this active media effects our designs is a pre-requisite to understanding how our designs with their emergent properties will be embodied in a given schema and meta-schema which is the environment of that schema. All the self-\* entities we build are embodied in some sort of schema and as such inhabit the next higher adjacent meta-schema. Understanding these schemas and their nesting is essential to understanding the degrees of freedom in our designs, and the possible self-\* properties that can be embodied in those various active media. There is greater and greater range of action and capability of embodying properties in the higher and higher schemas. We submit that we should not just think of self-\* and other-\* systems, but also meta-systems, forms and domains, patterns and worlds, monads and kosmi, facets and pluriverses. In other words we need to widen our view to the various schematic levels and to consider how the self-\* and other-\*, as well as dual-\* and nonudal-\*, properties and actions are applicable to those various projected levels of reality, identity, presence, and truth, i.e. with regard to all the aspect of Being at each level.

## **7. What is the nature of the Worldview as Meta-schema**

Just like there are various kinds of schemas of which the system, meta-system and special systems are just a few instances, there is a more general question as to the nature of the meta-schema, in other words what is it that are beyond the schemas which includes them, and what do we contrast the schemas to in order to understand their meaning. We call these the finitudes of the worldview. The schemas are just one type of finitude that exists in spacetime, i.e. at meta-dimension zero which includes all the n-dimensions in which embodiment is possible. However, it appears that there

are also meta-dimensions higher than zero, (and maybe ones less than zero). These meta-dimensions are related to the standings, aspects, regions, limits, and nonduals within our worldview. We are not very familiar with these transcendentals which hover like a ghost over the body of the schematized phenomena of experience. However, our transcendental philosophies have always taken advantage of this “headland above the world,” as Nietzsche calls it. These illusory transcendentals play a big role in being the contrasting difference between the schemas and what is “other than them.” We are in fact caught in an infinite regress that causes us to project difference in order to know what something means at the lower level, to be able to distinguish between self and other. How we limit this regress by which we project illusory transcendentals is a crucial question that needs to be addressed, because no ultimate distinctions, which are non-nihilistic can be made until this question is answered.

Recently I have been exploring the answer to this question as posed by Badiou in Being and Event. Badiou uses set theory as his source for the distinctions in ontology, and reads set theory in a Grand Style which would see it interpreted ontologically. He uses some results of higher set theory as a means of answering this question concerning the infinite regress of projected transcendentals as finitudes. He uses the argument concerning the Generics of Cohen as a way to answer the question of where the invisibles that are projected in experience actually are within the situation. Our own answer to this question sees the structure of the worldview written on the face of the world that appears immanently in the emergent event. We can use the idea of Cohen that Badiou praises in Set theory, as a means of locating the transcendentals between emergent events when they become merely implicit patternings in the situation and thus are invisible. Thus, Cohen’s concept of the Generic by which he shows that the Cantor Continuum Hypothesis is independent from set theory<sup>11</sup>, and that Infinite Cardinals can have arbitrary value rather than fixed value in relation to the first Aleph, is also the means of handling the problem of invisible transcendentals within the immanent body of a given situation. The transcendentals are supplements to the situation which cannot be seen in the situation because they are shared by everything in the situation and thus cannot be discriminated and distinguished. They only become distinguishable in the situation when the emergent

event occurs and we see the face of the world as the persistent structure of the emergent event.

This problem relates to the distinction of Self-\* and Other-\* schemas because without something different from the schemas outside of spacetime, so to speak, then it is impossible to ultimately tell self-\* from other-\*, allopoeiss from autopoiesis. Wrapping the transcendental back into the immanent realm as Deleuze teaches us to do is the key for understanding our discriminations between self and other. The fact that Badiou has found in Cohen’s work in set theory the *Generic* as a solution to this problem allows us to ground our schemas theory, and understand that the transcendental, meta-schemas always haunt the spacetime immanent realm, without necessarily having to be a headland beyond the world which Nietzsche has criticized the Transcendentalists for founding, i.e. founding a foundation outside the world as a fulcrum on which to base our distinctions in the world, like the self/other distinction.

## 8. Conclusion

The study of Self-\* systems raises a great deal of issues not the least of which is that we can discriminate the Self-\* of the objects we wish to design, from ourselves and other objects. This leads us ultimately to the theory of the Special Systems that can serve as a fundamental theory of the nature of Selves in general, but it is a theory that negates the idea that there are any substantive selves, a denial that the Buddhists have long held as an axiom of their faith. Because self-\* systems require some degree of reflexivity, in themselves, and in us in terms of understanding how to distinguish them, then we are led to look at other issues such as the difference between system and meta-system, the nature of systems and meta-systems in relation to other schemas, and the relation of schemas to other finitudes within the worldview, and then ultimately to the question as to how to distinguish transcendental invisibles from immanent embodiments. Merleau-Ponty was one of the first modern philosophers to consider this problem in his unfinished book The Visible and the Invisible. Whatever we might think this distinction between self and other is very problematic. It is like distinguishing different sides of a non-orientable surfaces, i.e. a mobius strip or kleinian bottle. But this difficulty just leads us back into the special systems because non-orientable surfaces are one of their representations. There is a labyrinth that we are drawn into if we question the nature of the Self-\* and Other-\* to any depth which is

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<sup>11</sup> McGough, Nancy, The Continuum Hypothesis, <http://www.ii.com/math/ch/>

both revealing and frustrating. On the one hand, it gives us a theory of such systems which is fully scientific, as it has a mathematical basis and associated phenomena. But on the other hand what special systems theory models is a network of mirrors within which we can easily get lost without ever finding ourselves and reminds us of the mirror house at the circus. Certainly this whole area deserves further research and work. But defining special systems theory in a version of Nondual Science which ultimately is not transcendentalist, opens up a problematic which should keep us occupied for some time to come as our science of the Self-\* matures. The fact that it provides us with a mirror into our own selves and our inner and innate emptiness is boon that many of us will find difficult to comprehend.