

# On The Social Construction Of Emergent Worlds

## The Foundations Of Reflexive Autopoietic Systems Theory

### Part 2: Reflexive Autopoietic Systems Theory

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#### 1. Abstract

This paper attempts to lay the foundations of reflexive autopoietic systems theory as a specialization of general systems theory. An autopoietic system is a closed cognitive-living system as defined by Maturana and Varela. A reflexive autopoietic system is by definition social. It can look at itself and act upon its organizational processes. Where the autopoietic system is homeostatic maintaining its own organization as a variable; the reflexive autopoietic system is heterodynamic, meaning it is ecstatic in its variety production. This essay seeks to provide a framework within which the relations between these different more specialized kinds of Systems may be understood in relation to each other.

#### 2. Keywords

Autopoiesis, Reflexive Social Theory, Formal-Structural Systems, Virtual Reality, Software Methodology, Self-Generating Component Systems, Worldmaking

#### 3. Disciplines

General Systems Theory, Theory of Emergent Worlds, Software Engineering, Systems Engineering, Ontology, Theoretical Sociology, Constructivism, Artificial Intelligence, Artificial Life and Artificial Intersubjectivity.

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## 4. INTRODUCTION

In part one an ontological theory was advanced on the basis of the work of Johansson, Goodman, Rescher, Ford, Goertzel, Coutu, and others. In this part we leave ontology behind and work instead to produce a systems theory or what might more handily be called a worlds theory. We assume in this subsequent part the background established in the first part. Our ultimate goal is to give a precise definition to the minimal social machine within the context of general systems theory. We will advance in that direction in stages starting from first principles (it is allowed to say this because we do not mean ontological principles but instead mean systems theoretic principles). We are building a network or rhizome of the kind that Rescher or Deleuze approve and are not deluded concerning whether it is possible to axiomize our systems theory. However, we will build this network meticulously step by step so that we may fully comprehend the nature of the social machine when we finally arrive at its door.

As was alluded to in the first part we will be applying the ways of worldmaking that deal with order and composition / decomposition. In this we follow Kant seizing on the strongest ways of worldmaking as the basis of our theory of worlds or domains or meta-systems or systems or objects or primitives. In fact, we leave open which ontological level we are building on here. Because the social generates worlds it underlies all the other levels as well. But to understand the social we must delve deep into the non-social. Thus we will leave the social for now in order to rediscover it later. Instead we will delve into Johansson's primary category Spacetime. We have noticed an important point in the last part of this series of essays. Between the projection of the fragmentation of Being and the splitting into Li and Chi there is a layer that generally gets forgotten in the ruckus of projecting Being and on its basis producing ideational glosses. That layer is called the layer of embodiment and it contained more than just where and when. It also contained *the how* and *the dirt* and *the edge*. These are the substance of embodiment or implementation. Spacetime is not a pure container but contains means and also the limitations of means by either its running into edges or its being fouled by dirt. The how needs a place to act and that is spacetime. The how has to contend with imperfection and that is in terms of limits and dirt. Embodiment is messy and complicated. There is no getting around that. But embodiment has the interesting feature of being beneath the projection of Being and the production of ideation. In fact, we can see that Merleau-Ponty's Wild Being gave us our first view of the realm of embodiment but still thought in terms of ontology. Deleuze and Guattari

talk about desiring machines which also border on embodiments. But embodiments are anti-theoretical and so not really captured by praxis or action guided by theory. Embodiments are, in fact, opaque. Merleau-Ponty still saw them as partially transparent. For Deleuze and Guattari we can talk about the higher intensities of the body without organs (read *Essence of Manifestation* ala M. Henry). We might say that Deleuze and Guattari operating within Wild Being still see embodiments as translucent. But embodiment itself is purely opaque. Embodiment represents the arena of practical reason and trial and error. It is understood on the basis of what Polyani calls tacit knowledge. This realm of embodiment is the haven of the Constructivists. It is the special province of hackers. It is the place where *real engineering* happens. It is the intermediate zone, the no-mans-land, between the splitting into Li and Chi and the projection of the kinds of Being as a basis of ideation. We will concentrate on this layer in our ontological model looking deeply at it in terms of ordering and composition / decomposition. And the question we will ask is whether spacetime has an inner structure that grounds the social. Here we are not helped by our analysis of Wild Being because we are below the layer at which Wild Being appears. We are in fact looking to ground the social, or more specifically the minimal social machines, directly in the structure of spacetime. If we can achieve that we will have driven the social as deep as we can into the nature of things. We see spacetime as the epitome of the non-social. It is that arena of the container without the contained. And how can we have the social without the contained -- the social things themselves. We can think of it as an exploration of the situation without the situated. We are led to this by the fact that Goertzel has already given us the mechanism by which non-continuous chaotic processes operate. But we need to discern the threshold of complexity at which these chaotic processes occur. To do this we must go down one level beneath the gloss of Being and the mechanism which contains reference to all the different kinds of Being that Goertzel posits. We must look into the inner structure of possibilities inscribed in spacetime and understand them anew from a different viewpoint. Only then can we produce a complete picture of the minimal social machine which operates according to non-continuous chaotic processes of the self-generating component system. As Goertzel would have it we could imagine those self-generating component systems to occur at any level of complexity or abstraction. He has outlined a mechanism for non-continuous chaotic process self-generation. But he has not situated the minimal social machine in terms of understanding its own special level of complexity. To understand that special level of complexity we will have to situate it in terms of the levels of other specialized systems in general systems theory such as the dissipative system and the autopoietic system. The social machine as a

reflexive autopoietic dissipative system and has a specific structure that is linked to those more basic specialized systems and to all other general systems. Through this analysis we will show how the social machine is the last possible kind of machine in this series. There is no supra social machine. Once we understand this series of machines we can then turn it upside down and realize that it is the social machine that grounds all the others as restrictions on its most general structure.

With this work we usher in the era of computational sociology and make it possible for Goertzel's dream of Artificial Intersubjective Simulators to come nearer to reality. We compare this work to that of Turing who defined the minimal computational machine. Here we go beyond this definition to define the minimal social machine which socializes instead of computes. Socializing is a more general structure than computation. So when we say computational sociology we do not mean society reduced to computation but instead the generalization of computation to include socialization. The fact that the socialization of these minimal social machines can occur within a computational environment is not as important as the grounding of the social in the non-social -- spacetime. Never again will we argue whether sociology is a science on the par with physics. Instead just as physics claims to be rooted in spacetime by virtue of a myriad of virtual particles being created and destroyed within the very fabric of spacetime, so to we will see that in the very fabric of spacetime is the basic structures upon which the social is based. But we must remember that when we speak of spacetime we do not mean the idealization of spacetime but the arena of embodiment which includes how, edge, and dirt. There is no pure spacetime. Only impure spacetime filled with debris and with given limits. There is only the spacetime encountered by the means or how and which thwarts perfect movement. And when we mention perfect movement we are getting close to the nub of the matter. The social is the projection of perfect movement within nitty-gritty of existential spacetime which balks at that perfection and subverts it. But the possibility of perfect movement is inscribed into the very structure of spacetime itself and this is the way in which the social appears within midst of the anti-social. Ultimately the two are inextricably intertwined. It is the purpose of this essay to understand the nature of that inextricableness.

## **5. ARCHITECTONIC**

Derek A. Kelly in his article "Architecture as philosophical Paradigm" gives us a good way to approach the building of out correlates (world or system or whatever) theory. He explains Kant developed the concept of philosophical systems having an

architectonic and then looks to architecture for an approach to philosophy in general. He then proposes four phases of the architectural process. We will attempt to follow him in these phases in our development of our correlates theory. This is because when we talk of embodiments architecture does give a good paradigm for our philosophical and theoretical work.

### 5.1. The Brief

Here the problem is posed. Our problem as stated above is to define the minimal social machine which will operate within the ontology developed in the previous part of this study. Our goal is to determine the level of complexity on which non-continuous chaotic processes operate which will explicitly and formally define the social.

The reasons for undertaking this project are multifold.

- First we want to ground our social phenomenology in a more formal model of the social. All phenomenological models suffer from imprecision and social phenomenology more than any other kind. This is a hinderance to the development of an ontological basis for social theorizing. Normally we just end by saying that there is the problem of intersubjectivity as the philosophical locus for our sociological theorizing. This is a great handicap to future progress in the discipline. Instead we must show that there is a direct link between social phenomenology and sociological theory. This requires us to be clear about our models of both. Clarity is normally achieved by constructing a formal system. Here we will be a little more sophisticated than to believe that we can just write equations and that is that. Instead we will delve into the foundations of any possible formal system that might attempt to capture the social. If we are to define the social it must be in terms of the non-social. Therefore if we take spacetime as the primary category which is by definition a social and more basic than any phenomena appearing in spacetime and we can show that the social is directly manifest within spacetime then we will have shown that no phenomena is more basic than the social so it either has equal footing with other sciences or is more basic.
- Another strain that leads to this work is the whole concept of embodiment as the intersection of multiple disciplines. Those of us working in engineering are pleased with development of the constructivist agenda because it means that those who construct for a living are finally being recognized as knowing something valuable. In constructivism the hierarchy of the sciences is turned upside down. Constructivism basically says that if you put things together sometimes you get unexpected results that you could not have just thought up. Thus doing is valued over theorizing perhaps for the first time in any academic discipline. But what this really says is that pure theory and pure engineering should not be separated so radically as they normally are in our society. In fact we know from experimental science that engineering of the experiment is a very important aspect of scientific work. What we really need to understand is that embodiment is the intersection of

many different disciplines as outlined in part one of this study. We need to explore embodiments in order to better understand this intersection of disciplines. Our work needs to be more than interdisciplinary. It needs to be meta-disciplinary in that it recognizes that meta-disciplines such as general systems theory and software engineering apply simultaneously to our problems. Also it needs to be trans-disciplinary in that it recognizes the social basis of all disciplines and the ontological basis of all our theorizing and practice. Domains intersect in worlds. Our fundamental job is world building.

- Another strain of our brief comes from the need to connect software engineering, artificial intelligence and life, and virtual reality or what Goertzel calls Artificial Intersubjectivity. These disciplines all are developing as if the others did not exist. All of these disciplines have or will in the future have significant social impact. Thus it is necessary to attempt to understand them within a single comprehensive view treating them as the disparate nodes of our network for cognitive systematization. The paradigm set forth here attempts to connect these intrinsically related disciplines together in ways that enhance our understanding of all three.
- Finally, there is the basic question which all my theorizing seeks to answer: How do new things come into existence? Artificial Intelligence is a new thing, and Artificial Life is newer, Artificial Sociality is barely off the drawing board. These are new fundamental ideas that have only recently arisen. The same is true for software engineering. All these new things arise within our worldview. How do we understand them in the context of the sociology of knowledge, philosophy of science and technology, or related disciplines. As has been stated before by G.H. Mead the social is tied intrinsically to the emergence of the genuinely new. By understanding the inner structure of these new things and new disciplines we advance our understanding of newness, especially if we use them to get a better hold on what the social itself is. Here we use the new things to expose the nature of the source of newness. This is a deep probing into the nature of existence.

### 5.2. The Design

Here we would like to outline the design of the minimal social machine. But we cannot begin our design which might result in an artificial intersubjective simulator imagined by Goertzel because we do not know at what threshold of complexity the social lies. We have a process to apply and could apply it at many levels to produce images of self-generating component systems. However, it does not tell us anything about the inner structure of the social machine and their mutual interaction. It merely gives us an outward picture of their interaction. So in order to do a design we need to know the limits on our design from outside. This is why we approach the a-social and attempt to elicit the inner structure of the a-social that allows the social to exist within it. It turns out that this gives us very precisely our design constraints for the social and identifies precisely the proper threshold of

complexity at which to run our simulation.

Thus in this paper we will not be concerned with design but with anti-design specifying the limitations within which design must operate. Hopefully on that basis we can proceed to design itself. But anti-design is not haphazard nor ambiguous. In fact, we will attempt to be meticulous in our anti-design proceeding stage by stage to lay down the foundations (as networks of necessary prerequisite concepts) that will allow us to get a good view of what constrains our designs of all possible social machines.

### **5.3. The Construction**

Now that we know we are doing anti-design we can guess that we are also engaged in deconstruction. De-construction has a bad name and rightly so. The generalization of Derrida's program by his followers leaves a bad taste in everyone's mouth that recognizes the nihilistic aspects of this philosophical and critical fad. However, the original impetus of Derrida's approach has some validity. Unfortunately it has deteriorated to such an extent that to claim alliance with it is to be sullied by association. Be that as it may, we can see deconstruction as a kind of analysis or decomposition. We promised to apply Kant's ways of worldmaking to our problem in this part of the study. Decomposition and order go hand in hand and assume that things easily break apart into components, such as the self-generating component system implicitly assumes. And we also assume that these components are ordered. So here we want to explore their component like nature and inherent order. Now deconstruction just adds to that the effects of the essence of manifestation or unconscious which makes it so any author produces distortions that can be analyzed along with the system of their thought to expose the contradictions within any author's thought. Deconstruction is a power play that focuses on the idiosyncracies of the other and disintegrates the subject behind the authorship seeing instead the differing and deferring of the text from itself. Now since we following Deleuze and Guattari, not Derrida, never believed in the integrity of the subject this is no great revelation. So it is ultimately not interesting because it seeks to prove something we assume. But more importantly we are studying in this section things like mathematics, logic, and the nature of spacetime which are not "subjective" in the same sense as works of philosophy or novels. We are studying the most fundamental intersubjective phenomena -- the projection of spacetime and its inner structure. So we are not concerned with the subject and its fragmentation but only with the unity of the intersubjective in its strongest form. This means that for us the distortions of texts by the fragmentation of the subject

translates into the opacity of the intersubjective to the subject. So when we look at spacetime which every ontologist takes as a primary category and attempt to decompose it and discover its order we realize that our view is distorted from the beginning. Kant expressed this by saying that we apply a schema to space and time (he thought they were absolute and separate) which makes it into what we experience and that we really have no idea what space or time are themselves. However, despite this we have good luck modeling spacetime intersubjectively in ways that allow us to fly to planets of our solar system and beam back pictures or walk on the moon and return. So the whole problem of deconstruction is transformed in the context of social phenomenology. The problem becomes to discover what allows us to be connected to each other in spite of now really seeing how that connection works. We cannot introspect into each others minds (unless you accept ESP) yet we can describe the components of spacetime and its ordering in such a way to coordinate our efforts to accomplish very sophisticated maneuvers in spacetime. Of course this is known as the Cartesian coordinate system and the definition of perspective on that coordinate system that allows this to happen. Fancy math is used to describe trajectories and velocities and accelerations. But all of the mathematical apparatus merely exploits properties we are able to successfully project on spacetime even though we do not know ultimately what it really is like. The differing and deferring comes between the multiple subjects and their grasp of the true nature of spacetime. Spacetime is the ultimate empty text which we see distortions in that show the fragmentation of the intersubjective cohort. Looking deeper we can say that spacetime is a palimpsest on which there are multiple grams written overlaying and obscuring each other. The traces are like the indentions in a writing pad which we shade to read what was written there. When we shade we call attention to the empty space of the pad. Wild Being looks at that empty space instead of the indentions made by the grams. That empty space as physics posits it is alive with the creation and destruction of particles and anti-particles. It is a clearing within in which reversibilities appear. It is still translucent. But if you just take all the reversibilities, the possible interferences that constitute the substrate itself, without the clearing that separates them, then you get the pure opacity of embodiment. Wild Being still sees some distance or spacing that makes the field between the grams. Beneath the layer of projecting ontology this clearing vanishes and spacetime becomes a pure noumena. At that point the differing and deferring of the subjects from each other with regard to their individual understandings of spacetime cannot be distinguished from the differing and deferring of the empty holder of the text of spacetime itself.



We must actually admit that anti-design of the social machine cannot be distinguished from the deconstruction of our intersubjective view of spacetime. The constraints on the social machine appearing within spacetime are the same as the unknowableness of spacetime as a social construct. This result makes us wary because we find ourselves living though the lifeworld within spacetime that others are also living within. None of us really knows what it is but we have very sophisticated ways of communicating about it which makes all our most basic social operations possible as well as many sophisticated social maneuvers such as going to the moon together and returning. It determines the nature of our social interaction but we are projecting it because we do not really know what it is. This is the kind of interaction that Goertzel calls self-generating. But the thing that is self generating here is the entire social cohort projecting the field of its own social relations that in turn are the conditions for having social relations. Spacetime envelops the social but from another point of view the social envelops spacetime because its intrinsic properties must be projected on whatever is there as noumena in order for the coordination within space to occur. That coordination in spacetime produces a social space that is directly experienced as part of and a foundation for the lifeworld. Social spacetime is abstracted into physical spacetime which is then projected as an objective reality. It is that objective reality and the aspects of it we do not experience, that remain theoretical which talk about the noumena of spacetime but never completely capture it. The noumena of spacetime may be equated with the intersubjective itself which is likewise not transparent to us. When we do this we suddenly understand that the nature of social space being primary may not be so far fetched. Since we cannot know objective space fully it is possible that the part we do not know is exactly the part that makes it possible for space to be social in nature and support individual subjectivities separated from each other and interacting in spacetime. This brings us back to the substantiation of Bell's theorem. Particles that were once together can effect each other across spacetime, at a distance with immediate effects. Here we return to Johansson's idea that intentionality always operates at a distance. This operation at a distance is one way of seeing the social. But instead of positing it as some mysterious force we can instead say that spacetime is intrinsically social so that operations at a distance are really an aspect of spacetime itself in its social aspect. Thus two particles that were once together have a bond across the social aspect of spacetime just as subjects that operate at a distance from each other in the social field and produce nested intentional structures. This establishes that everything from particles to reflexive autopoietic systems can participate in this social aspect of spacetime in order to establish immediate connections across spacetime which are synchronized in spite

of communication delays. Synchronization relies on backward processing which for particles are Feynman diagrams where particles move backward in time and for people are the backward processing of memories in order to project intentions. The social nature of spacetime from an intersubjective viewpoint is an obscure aspect of existence which deserves explication within the framework of social phenomenology. But to do this we must dive into spacetime itself and see what its nature is as intersubjectively constructed.

#### **5.4. The Obduction**

We would like to design and construct social machines. But we must first do anti-design and deconstruction in order to understand the constraints under which our design would have to operate and to understand the opacity of embodiment in spacetime itself. And the ability to undertake such a design is the obduction of our study. Obduction means to Kelly the environment that the building creates. Here we are not discussing the building of inanimate objects to house living intelligent social beings but the design and construction of the social being themselves in their minimal manifestation as embodied in spacetime. So the environment that our study should create is the ambiance in which Artificial Intersubjectivity might be pursued with rigor and zeal. But once social machines are designed using non-continuous chaotic processes and at the correct threshold of complexity then they will create their own environment which will be a designated virtual reality that we should be able to study and interact with. Thus the obduction of anti-design and deconstruction will be design and construction of minimal societies. The obduction of minimal virtual societies will be virtual worlds produced as shared belief systems emanating from minimal virtual societies. Because of this ultimate obduction we can characterize our process as world design for the minimal virtual societies must produce minimal virtual worlds. The study of these minimal virtual worlds must be essential to a general theory of worlds and any understanding of baroque virtual realities that may be constructed by humans to interact with each other and their artificially intelligent living social creatures which inhabit different ecological niches in cyberspace.

The recognition by Kelly of the necessity to explore the environs of a theoretical or philosophical system and see how it effects us as we dwell within it is very significant. It reaches out to the phenomena of embodiment which is actualized in the obduction. Dwelling in the world means being embodied within the world. It is more basic than being-in-the-world which projects Being (unified or fragmented) as a gloss across the surface of things. Dwelling does not project but lives with the

opacity of self and things, encounters limits and imperfections in every action, and finds ways to get around, over, through the obstacles or discovers the meaning of being blocked at every turn which can be fated as well. We explore dwelling by first constructing a formal gloss as a grid to take our bearings by and then understanding that grid in new ways to illuminate the dark landscape of embodiment below the grid. Our presentation of the grid of order and decomposable parts will be continually haunted by the actuality of embodiment and occurrence. Through that haunting we will slowly form a picture of the social nature of embodiment through our developing understanding of the social nature of spacetime.

## **6. A POINT OF DEPARTURE**

We are going to take a journey through seven stages in the development of our overview of systems theory or worlds theory as it relates to dissipative autopoietic reflexive systems. This theory is a completely different way of looking at old territory so we are going to begin by asking the reader to suspend disbelief until the entire story is told. Bracketing is a good old phenomenological tool we can invoke right now to allow the reader to grasp this new way of seeing things which might be thought of as a paradigm shift. Certainly we are going to cover some familiar topics but with a new twist that will make them seem strange to us and make us wonder if we ever really understood them before. But this is a whole narrative which can only really be grasped once the whole story is told and all seven stages have been explained. Then once the reader has seen the entire vista it is left to them to decide how to evaluate our efforts. But the reader who stops at every point and criticizes without having gotten the whole picture will ultimately not be in contact with the full theory enunciated here. The implicit warning is that this in Kuhn's terms is abnormal science not normal science. If you approach this as normal science you will be missing the whole point. If you suspend disbelief for a while and try to imagine your self in this world then you will get more out of the presentation which cannot be gotten in any other way.

### **6.1. Peirce's Categories**

Charles Sanders Peirce is the source of Pragmatism and he had a theory which we will outline as part of our departure on our journey. The categories of Peirce are conveniently named First, Second, and Third. They are not categories in the sense of Johansson or Kant or Aristotle nor in the sense of mathematical category theory. They are in fact ways of looking at the complexity of things. Firsts are isolated

instances of something. Seconds are relations among any pair of isolated instances. Thirds are derivative relations which bear the significance of the relation. Peirce was a logician, in fact he invented existential quantifiers and thus advanced logic in a fundamental way. But beyond logic he liked to explore the relation of logic to the world and thus coined the term pragmatism. Pragmatism basically says that scientific method is the basic way that humans relate to everything in the world. Peirce sees science as intimately related to logic as the application of deduction, induction, and abduction. Abduction is his own invention and comes from an analysis of the syllogism. Abduction is basically the means of logically formulating hypotheses. It is equivalent to all intents and purposes to Husserl's essence perception. Now logic is about forming relations and reasoning about relations between things using what is called first order predicate calculus. But in order to form relations the relata must preexist and it is the work of formal ontology to provide those existents to be related and manipulated. These existents are Firsts. But beyond logical manipulations (Seconds) it is necessary to make sense of what we see related. Thus thirds supply us with the significance of the relations as a level on top our logical manipulations. Peirce attempts to prove that these three are the only levels that can occur. This is called the Peircian reduction thesis. All higher order relations can be reduced to either Firsts, Seconds, or Thirds. Many logicians wish to reduce everything to the dyadic relations that are manipulated by logic. They do not recognize the importance of the significance of these relations but merely rely upon the mechanical manipulations and proofs that can be produced using logic. Thus Peirce must also assert that Thirds cannot be reduced to dyadic relations. He stands his ground on the non-reducibility of thirds and the reducibility of all higher relations to seconds or thirds.

We will not delve deeper into Peirce's theory than this but suffice it to say that he develops a new science of meanings called semiotics that is parallel the semiotics posited by Ferdinand Sussaire. It is a novel theory that in many ways seeks to develop the insights of Hegel. Hegel develops the concept of synthesis of contraries as the basis of his logic. Pierces semiotics makes the production of synthesis as a third arising out of the interaction of a dyad into a complete working theory and not just an ontological category system. Hegel of course got his idea for the dialectical categories from Kant who posited dialectical relations between the categories in his category table. Hegel seized upon this and made his whole philosophy an emanation from logic through dialectics. After all dialectics is merely an explosion of the ability to draw conclusions in the syllogism. Through the process of drawing conclusions one can induct or deduct. If one starts with the

most general category and begins deducting one gets the idealist categorical hierarchy. If one starts with phenomena and begins inducting one gets the successive higher levels of the phenomenal hierarchy. The combination of the two is called absolute reason. That is reason embodied within the phenomena and inextricably interlinked and embedded with it -- noesis completely enmeshed with noema. Peirce merely takes this one step further and says that we do not need the hierarchies but can discover the absolute reason in the phenomena themselves through the scientific method. All we need is a means of explaining the meaning of the of our inductions and deductions and relating them to the world. Abduction relates them to the world and Thirds as a by-product gives them significance that makes them meaningful to us. Peirce by this reading is working in direct descent from the program set in motion by Hegel that makes us recognize the importance of emergent levels and their relation to our reasoning. As a pragmatist Peirce is more concerned with embodiments than Hegel the idealist. Pragmatism is in fact scientific idealism which says that science is the basic way we relate to the world and that it is capable of understanding everything. It was of course formulated in a day where that appeared to be the case. Pragmatism is a middle ground between dialectical idealism and dialectical materialism. It sees the praxis of science not the praxis of work or theorizing as the basic way or humans to relate to the world. Science contains both theorizing and the work of experimentation together in a working whole that allows us to make seemingly unlimited progress. Pragmatism turned out to be the great American dead end of philosophy. If philosophy is nothing other than science and technological know how then why do we need philosophy. We are still trying to recover from that line of reasoning. Mean while Europeans kept on thinking and the result was Analytic and Continental schools of philosophy. The former degenerated into word games and the latter hit the problem of intersubjectivity. We take our basic problematic from continental philosophies impasse combining it with the insights of little known pragmatist philosopher G.H.Mead who realized that science was essentially social as was work and theorizing. He was an almost lone crusader against the predominance of behaviorism which psychology had degenerated into without the guide of philosophy. He developed the sociological perspective called symbolic interactionism and showed how the social was an irreducible phenomenon over and above individual behavior. Symbolic Interactionism may be seen as a latter day development related to Peirce's semiotics which had forgotten those roots. Symbolic interactionism tells us that we can see the interactions between social beings in terms of the transformation, transduction, and transference of symbols. Symbolic Interactionism will form a fundamental basis for the work we are doing in

this study.

## 6.2. Fuller's Synergetics

We are going to introduce a fundamental change to the Categories of Peirce based on the work of Buckminster Fuller. We will posit that Peirce was wrong about Thirds being the highest meta-level phenomenon. Instead we will say that there is one higher level called Fourths. And we will basically take the same stand that Peirce did with respect to Thirds which is that there is no higher level and that all higher relations may be reduced to fourths or some lower kind of relation. A Fourth is a true synthesis. Thirds that occur as significances stemming from relations are partial syntheses. Fourth combine these partial syntheses to produce a new unity that integrates and creates a synergetic unity of those partial syntheses. A fourth is an example of a new thing which arises from but goes beyond the information given. Thirds never actually go beyond the information given but merely provide tangential knowledge. The fourth manifests at least a partial wisdom. Thus we have the hierarchy:

*Table 13:*

First	Data
Second	Information
Third	Knowledge
Fourth	Wisdom

When we say wisdom here we mean it in the most mundane sense as a synthesis of experience and knowledge which rises above both. But what we really want to emphasize is the quality of synergy that all Thirds lack but which is a clear phenomena in any design work. Synergy is the reuse of the same part for multiple functions. A synergetic system has many parts with multiple functions operating together in harmony. That harmony following Chang can be Logical, Interactive, Mutually Supportive or Interpenetrating. Systems of significance lack synergy. Each significance is an independent relevance or meaning with no necessary connection to anything else. B. Fuller attempted in his two volume magnum opus Synergetics volumes I & II to define and give many examples of synergy. Synergy makes us look at the architectonic of our conceptual systems and discern the correct thresholds of complexity at which a theory of a given phenomena should be poised. This is what leads us to look at the correct level of conceptual complexity to place each of our specialized systems theories that make up our theory of worlds. Each

phenomenon has its specific level of complexity which we must match with our conceptual complexity in order to produce a good representation. It is synergy that allows us to appreciate the nature of different thresholds of complexity in relation to their theoretical expressiveness. It is synergy that allows us to grasp theoretical and phenomenal wholes. Thus the synergy is the interface between the phenomenal and ontological hierarchies and the adequation between noema and noesis.

How can there be another level beyond synergy? What is there beyond a whole? Only fragmentation exists beyond the whole which is necessary to construct a perhaps more comprehensive whole. Synergy is the pivot between composition and decomposition. Synergy is what allows us to decompose intelligently cutting as Plato says at the joints like a good butcher. Synergy allows us to compose in such a way to realize wholes greater than the sum of their parts. Thus synergy is the key to the application of the synthesis and analysis (or composition and decomposition) way of world making. Our notion of system as presented by Rescher and based on our knowledge of organisms is a an abstract picture of synergy. Higher ontological level correlates are even more synergetic than that. Meta-systems, like operating systems, are combinations of interworking systems which may display any degree of harmony. Domains are interworking meta-systems and Worlds are interworking domains. At each level the amount of necessary synergy increases at least by an order of magnitude.

So we add to Peirce's meta-logical categories on further one which introduces something stronger than partial synthesis but is instead unitary synthesis into a whole. We can characterize Hegel as opening up the realm of logical synthesis as a possibility and Peirce filling that realm with a praxis that realizes continuous partial synthesis. But it was B. Fuller that fully actualize unitary synthesis by pointing out that it is more than merely raising ourselves to a new ontological level and more than deriving significance at the new level for phenomena at the lower level. Instead it is the realization of the unity of the new level in relation to the old level. Koestler proposes parts as holons or wholes when viewed from the top and parts when viewed from the bottom. But it is George Leonard that proposes the term holoid for the holographic phenomena where the part contains a partial reflection of the whole so that every interpenetrating part has a model of the whole and its place within the whole. At the highest level of harmony the synthesized whole is a holoid rather than just a holoarchy. Goertzel speaks of his dual hierarchy composed of heterarchy and hierarchy. That dual taken as overlapping mapping must be a holarchy and that holarchy must ultimately approach being holoidal.

Fuller's model of synergy in his two volume magnum opus was the Platonic solids in three space. He showed many interesting relations between these platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedron) and other regular figures. He considers higher dimensions in as much as they are projected on or embedded in threespace as motions or degrees of freedom. However, the best example of synergy is the structure of higher dimensional platonic solids. For instance, the simplest regular solid in four space is the pentahedron. It is composed of five points, ten lines, ten triangular surfaces, and five tetrahedrons. It is represented by a lattice 1-5-10-10-5-1 and appears as all minimal higher dimensional figures as layers in the triangle of Pascal which by the way was discovered by the Chinese long before Pascal. We see synergy at work in this figure because the ten triangles would normally need 30 lines but it reuses the ten lines of the figure to produce ten triangles. Likewise the five tetrahedrons embedded in the pentahedron would normally need twenty triangles to make their sides but the sides are reused so ten triangles do the trick. This reuse of the components of the figure itself to produce different aspects of the same figure is an excellent example of synergy which all higher dimensional polytopes display. It is this folding together and reuse of elements which play multiple roles within the whole is an excellent example of synergy. In fact, though Fuller confined himself to three dimensional figures for the most part it is really higher dimensional figures that exemplify synergy the best. And we will be exploring in this essay many aspects of higher dimensional synergy. But the main point we wish to make is that synergy is something that Thirds alone on in combination with Firsts and Seconds cannot produce. Synergy is an emergent quality which may appear at any level in the ontological hierarchy along with Firsts, Seconds, and Thirds. It is important to separate these Peircian categories from each other and realize their distinctness. We will not venture a proof here of fourths but appeal to intuition. At each ontological level it is the essence that has the nature of the Fourth. Though Peirce discovered abduction it is not identical to the essence itself. Abduction and the essence are complementary phenomena. Abduction is tied to the syllogism and simulates the hypothesis in the confines of Logic. The essence is tied to the description of the object that is reasoned about and is an intuition of kindness. So what we have are parallel aspects in noesis and noema. The essence gives insight to the noesis into the kindness of the noema. The abduction or hypothesis gives foresight to the noema into the knowledge of the noesis. Which is to say that it is through the hypothesis that we step outside what is given to project what might be. We project onto the noema and that turns into knowledge which is apprehended through noesis. The parallel construction of the sentence about abduction stretches our normal use



of language. But we see thought such a obdurate construction the different roles that abduction and essence intuition play even though they are basically the same phenomena seen from the side of noesis or noema. And so we see that abduction and essence perception are what give us knowledge of synergy. Kinds are synergistically coherent and so are our theories based on abduction. Abduction and essence perception are our windows on synergy within the world and within our heads. But we know that really synergy in both are the same because noesis and noema are just two sides of the same coin. Thus we have a way to understand synergy that takes us beyond thirds. Thirds do not need a special intuition because they arise from the production as significance from the production of relations which occur through induction or deduction. Thirds are a side-effect of our relation building and relation manipulation. It is the action of building relations produces this side effect. With synergy we go beyond the network of relations as it is constructed and see the harmony within those relations. That harmony appears as kindness and it leads us to make abductions which go beyond the information given to express the whole gestalt.

We can talk about the Piercian-Fullerian categories in terms of our basic approaches to social science that involve distancing. First are pure distancing. They view whatever it is under scrutiny as a plenum of unrelated bits of content of one kind or another, isolated primitives, objects or systems etc. So for phenomenology it is isolated bits of hyle or the content of consciousness; for hermeneutics it is the isolated elements of the text to be interpreted; for structuralism it is isolated lacunae, discontinuities, gaps etc.; for dialectics it is the isolated theses or parts. Seconds appear as pure relations projected upon the Firsts. Here we see not pure distancing but pure relation as the web of connections between all ontic components which are seen as relata. For phenomenology this is the morphe of intentionality relating everything in consciousness through the dictum that consciousness is “consciousness *of* something”. For hermeneutics it is diacritical meaning which is the significance of everything in relation to everything else posited by Sussaire. For structuralism it is the transformation that connects two seemingly different forms on either side of a lacunae or gap. For dialectics it is the whole that encompasses the part. In each case pure distance is overcome by the projection of some unifying substrate. Pure distance of Firsts is counterpoised with the pure unity or inseparability Seconds which is the basis for seeing relations. So in Husserl we see him projecting the intentional morphe on the hyle to produce noesis and noema. In hermeneutics it is the projection of significance on texts that produce interpretations. In structuralism it is the projection of functional transformations on

discontinuities that produce structural relations. In dialectics it is the projection of wholes on parts that produces partial synthesis. In each case the dialectically thing that arises out of the coming together of the pure distance with unity is the third: noesis/noema, interpretations, structural relations, and partial synthesis. These are all side-effects of the collision of pure difference with pure identity. But these side effects do not actually describe the phenomena itself completely. This is why essence perception and abduction are necessary that allow us to see kindness and build knowledge. Beyond the mechanisms of induction and deduction as they apply to each of the approaches to social science there is direct intuition of the inner coherence of natural complexes. This allows us to see the phenomena themselves through our ideational structures projected upon them. Thus in the case of phenomenology there is essence perception which is the perfect balance of noesis and noema that allows us to see kindness. If we turn this around and consider science it is this balance that allows our hypotheses to be true about the physical world and adequation between our conceptual structures and natural phenomena occurs. In the case of hermeneutics we actually see meaning through the hermeneutic circle (spiral really) or rather in spite of it. When we see meaning we grasp it directly from out of the center of the spiral which is in fact empty. In structuralism we see that the discontinuities that we are mapping across have a life of their own and we grasp their actuality. In the case of dialectics we see true synthesis through all the partial syntheses -- which is to say we can see the holoidal nature of things through the picture of the holons. In every case there is a reaching beyond the information given to produce either a picture of the nature of the thing, or a meaning, or a structural coherence, or a genuine synthesis. This is synergy and each of our approaches to social science changes its nature as we approach the expression of harmony. Now heuristic research takes the exact opposite tact. It starts with harmony through direct communion with the object of investigation. Heuristic research works out from the empty center instead of inward. Heuristic research assumes that there is a deep connection between what ever phenomena one is investigating and one's self and starts building from there rather than assuming difference between the self and the phenomena. Starting from the sameness of self and phenomena Heuristic Research can base itself on meanings, on direct apprehension of the phenomena, on direct intuition of structural coherence, and upon direct understanding of the inner coherence of the holoïd. It uses the tools of distance to explicate these samenesses it directly experiences. It starts from gatheredness and adds in separation instead of starting from separation and adding in gatheredness. As such Heuristic Research experiences the world completely different from the distancing approaches of social science. Social science which

want above all to be considered a science no matter what that costs in the end always appears as empty. Heuristic Research is in the end always full because it seeks to fulfill the self by immersion in the phenomena of study using the resources of the self to understand the phenomena. And since that self is socially constructed it never becomes solipsistic like the subjects who pursue social science by beginning with distancing. Heuristic Research takes every thing personally but keeps going till it goes deep enough to reaches through the subjective unconscious to the collective unconscious so its results are intersubjectively valid.

So Heuristic Research starts with synthesis and allows side effect meanings to emerge from them so that Fourths naturally devolve into Thirds. And out of thirds one sees the relations between everything which are the Seconds and finally one sees what is related that are the Firsts. Heuristic research is an idealism that sees ontological levels emanating from the pluriverse. The social science approaches see the phenomenal layers building on each other starting from the utmost physical primitives and building up toward the social. Social since never quite arrives at the social from its starting point in the physical, there is always something missing. Heuristic Research starting from the Pluriverse does not quite arrive at the ultimate physical primitive, there is always the possibility of something more primitive.

### **6.3. Mathematical Categories**

Now we will not dwell upon this but it is necessary to introduce another kind of category theory developed in mathematics. It is our means of seeing pure relations. It is the inverse of set theory. Sets contain elements that are related to elements in other sets. Category contains only arrows that connect the elements without the elements themselves being necessary any longer. Thus we can see that mathematical category theory give us a picture of pure relation or Seconds. Mathematical category theory proves it is possible to construct a purely noetic theory of relations that discards the noematic elements with the relations are grounded in. The purpose of mathematical category theory is to allow us to show that one set of relations are equal to some other set of relations. And ultimately this is meant to show that sets of relations in different categories are identical. Thus some theorems proved in group theory may be structurally the same as other theorems proved in vector spaces or some other kind of mathematical category. We will use this theory of categories in a very loose way to be able to manipulate opposites and see how two things have the same but opposite structure. This is achieved in category theory by the reversal of arrows. When ever anything is proved in category theory if the arrows of the proof are reversed then one gets the

dual proof. We will often reason about things using an informal notion of the production of the dual proof by reversal of arrows. Generally we will note that important structures are duals of each other. For instance, in geometry the icosahedron and dodecahedron are duals as are the cube and octahedron. The tetrahedron is its own self-dual. The reversal comes by applying the hierarchy point, line, face, solid starting at either end of the lattices that correspond to these polytopes. For instance, the octahedron and cube have the lattice 1-8-12-6-1. The cube has eight points and the octahedron has eight sides. The cube has six sides and the octahedron has six points. This reversal is a simple example of the kind of duality that occurs from reversing arrows to produce a dual. Category theory was created because it is more elegant than set theory needing no difference between element and set and no distinction between different elements in different sets at either end of mappings. Category theory has only meta-sets of pure relations. The ontic aspect of the endpoints of the arrows is forgotten. This allows mathematics to detach itself from any consideration of ontology because it no longer needs to consider the reality of the things being manipulated and systematized. Category theory allows mathematics to pretend to be purely noetic. For category theory its objects are the mathematical categories it is producing meta-relations between. Those categories are pure syntheses that are fourths. Category theory skips the level of meaning and it disengages from the ontic level of arrow endpoint correlates. It produces a picture of the relations between syntheses like the category group theory or the category topoi. Categories themselves have their opposites so set has anti-set. Normally these opposites collapse together as really being images of the same thing. However, it is intriguing to think of what the opposite of category theory might be like. It would obviously have only ontic elements with no relations between them and it would have significances without any pure synthesis. But is that not exactly the kind of picture Johansson painted for us of vectors. Vectors have direction and magnitude. The magnitude is the ontic base to which is added a side-effect which can only be conceived based on calculus which makes them pure positions in spacetime. Thus we could say that there really is a dual to category theory and that is the kind of mathematics used by physics to understand natural phenomena in terms of acceleration and force. So if we were to put category theory together with some form of vector mathematics we would get a complete picture of any one ontological or phenomenal layer in terms of all four Peircian-Fullerian categories. And so it is that vectors are a category among other categories so category theory envelops vector mathematics. But on the other hand category theory itself is based on arrows in sets or bundles which are like the vectors in that the arrow expresses direction and the bundle expresses magnitude. We get

magnitude by counting identity operations within any given bundle. So we can see that in some ways category theory fundamental elements can be seen as similar things to vectors. Thus there is a duality between vector arithmetic and category theory in some strange way which allows us to see how Johansson's vector arithmetic fits into a grander scheme that sees not just ontic elements and directionality but also categorical synthesis and pure relation. Taking these together it is possible to construct a complete picture that encompasses all four levels of the Peircian-Fullerian hierarchy.

#### 6.4. Machines and Spacetime

Now another element we need to discuss as part of the preliminaries is our conception of the machine and our conception of spacetime. We will be using as our starting point for considering minimal social machines a conception of a machine developed by Arbib and Manes under the rubric of "Machines in a Category."<sup>1</sup> In this article they attempt to subsume sequential (state) machines, linear (control) machines, stochastic (state) machines, and tree automata in to a single "***Machine*** category" of the mathematical category theory type. We will not dwell upon this formalism except to when it is necessary to ground our discussion in a specific theory of machines. But this article contains a crucial point for us. This is the realization by Arbib and Manes that it was possible to unify all these different representations of the category ***Machine*** by changing their conception of category theory arrows into processes.

We first need a crucial change in viewpoint which is one of the major contributions of this paper: We think of the input not as the set  $X_0$  but as the process (functor)  $-xX_0: C \rightarrow C$  which transforms the state set  $Q$  into the set  $Q \times X_0$  upon which the dynamics  $d$  acts. We reserve the symbol  $X$  for the entire "process"  $q \rightarrow x X_0$ , explaining the zero subscript appearing in section 1. This viewpoint yields the following immediate generalization.

Definition. A process in an arbitrary category  $K$  is a functor  $X: K \rightarrow K$ .

$\text{Dyn}(X)$  denotes the category of  $X$ -dynamics whose objects are pairs  $(Q, \delta)$ , with  $Q$  an object of  $K$  and  $\delta: QX \rightarrow Q$  a morphism in  $K$  (note that for each  $Q$  there may be many  $\delta$ 's) and whose morphisms  $(Q, \delta) \xrightarrow{f} (Q', \delta')$  are  $X$ -dynamorphisms, being  $K$ -morphisms  $Q \xrightarrow{f} Q'$  rendering

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I.M.A. Arbib & E.G. Manes "Machines in a Category: An Expository Introduction" SIAM Review Vol. 16, No. 2, April 1974, pages 163-292

$$\begin{array}{ccc}
 QX & \xrightarrow{\delta_2} & Q \\
 fX \downarrow 1 & & \downarrow 3f \\
 Q'X & \xleftarrow{\delta'_4} & Q'
 \end{array}$$

commutative (so that an  $f:Q \rightarrow Q'$  may be a dynamorphism  $(Q, \delta_1) \rightarrow (Q', \delta'_1)$  and yet not be a dynamorphism  $(Q, \delta_2) \rightarrow (Q', \delta'_2)$ ).

Henceforth we shall only consider processes that share with  $-xX_o$  the property that there exist free dynamics.

Now building on Goertzel's insight concerning self-generating systems this definition of a machine will serve us well. Here a *process* on any Category is a functor that maps the category into itself. This is like having a class be a member of itself which is allowed in hypersets. Only here the emphasis is on the functor and not on the self-generative processes that appear in Goertzel's model at each instance. Here processes are the functors between instants of category that map that category into itself. What we see is that this is the dual of Goertzel's model which is vectorial that occurs when category is applied instead. Here the gap between instants is turned into the relation of a category to itself.

Definition. A **machine** in the category  $K$  is a 7-tuple

$$M = (X, Q, \delta, I, \tau, Y, \beta),$$

where  $X$  is an input process

$(Q, \delta)$  element  $\text{Dyn}(X)$ - we call  $Q$  the state object,

$I$  is an object of  $K$ , the initial state object,

$I \rightarrow Q$  is a  $K$ -morphism called the initial state,

$Y$  is an object of  $K$ , the output object,

$Q \rightarrow Y$  is the output map.

This definition is honed to the conception of processes as functors in which categories are mapped into themselves. There are many different dynamics that are based on the input  $X$  which determine the state of the machine. Every machine has its initial state defined either deterministically or stochastically.  $I$  is that initial state. The initial state maps into the stateset  $Q$  as the identity mapping. After the initial state then all the behavior of the machine is based on the mapping between the stateset  $Q$  and the output objects  $Y$  in combination with the dynamism that takes

Q back into itself at the next instant.

We will not dwell upon this formalism. The major reason for introducing it was to show that category theory was the opposite of the vector conceptualization and that this category of machines is the opposite in some sense to Goertzel's model. In Goertzel's model processes are in the moment and separated from the processes that exist in the next moment. In the categorical formulation of Arbib and Manes the process is exactly what takes you across the gap between instants and that is what allows them to think them as functors from a category onto itself. Notice they are functors and not the arrows within a category that describe its internal structure. Arbib and Manes have come up with the brilliant notion that functors can act back upon the same category not just connect categories with other different categories. This self action of categories on themselves via functors is what is equivalent but dual to the self-generation that Goertzel posits where a process is an element which generates other elements acting together with other elements in order to produce via the filter (a conspiracy of all against all) the processes that will exist in the next instant. Processes are like magnitudes with directionality toward the next instant and acting in communion with other elemental processes. But we can consider the whole as a category acting back on itself instead. It takes the set of self generating processes that exist as the input set  $X$ . There is some initial set of self-generating components to start with called  $I$ . There is an initial kickstart where the initial state is mapped into the set of states connected to inputs. Given the internal states of the self-generating processes  $Q$  plus the actual set of self-generating processes present  $I$  we are given new internal states  $Q'$  and the actual existent set  $Y$ . What you will notice about this formulation is that the internal states of the self-generating processes is related to their actual occurrence in each instance. Inputs and Outputs are the occurrences and changes of state refer to their internal state. These two interact to allow them to self-generate as a community. That communal SELF-generation can be seen from the outside as the category of the self-generating component system acting on itself via a functor. This opposite view allows us to see the social nature of the self-generating component system better. It allows us to see also the gap between instants as a continuity of the category acting back on itself which is of course a model of self-grounding transcendence.

Now we want to see this model in the context of spacetime because we are studying social machines in spacetime not in some disembodied abstract state. In order to get a view of these self-generating component systems as machines acting on themselves via functors we will require a view of machines in space. This is

supplied by Y. Feldman and E. Shapiro in their article “Spatial Machines: A more realistic approach to parallel computation.”<sup>1</sup> This is an interesting text that gives us a view of the relation between the sequential and parallel processing that Goertzel talks about as the relation between consciousness and the unconscious parallelism of the brain. We speak of dark matter of the universe when we know it must be there but does not give off light so we can see it. Similarly the parallel processing of the brain we know is there because of brain structure but since we only see limited parallelism in consciousness we know something big and important is missing and that we are really only seeing the tip of the iceberg of what is really going on. Feldman and Shapiro want to produce a realistic model of computation based on the paradigm of cellular automata. They develop the concept of spatial machines which is a finite set of moving computational machines in a three-dimensional cellular space. They show that moving computational machines are intrinsically parallel where as stationary computational machines are intrinsically sequential. Each machine can move to empty cells or emit and receive flying bits that move through empty cells between movable machines. Thus they work out a scheme where memory is actually held in space and a turing machine is actually two computational machines working together. One is sending and receiving different patterns of bits changing them by writing new sequences of flying bits as they go by while the partner computational machine merely reflects the bits sent by its partner. Thus one partner is active and the other is passive. The tape is increased in memory capacity by moving the two machines further apart.

Now what is good about this theory from our point of view is that it explains the relation between motion and computation. Moving computational machines are inherently parallel whereas static ones are inherently sequential. This also allows us a direct connection between our machines and directionality so we can follow Johansson to construct computational vectors. Computational machines have intentionality associated with their motion because that motion can also have velocity and acceleration as well as acceleration of acceleration. Thus the computational machine gets a direct connection to the meta-levels that end in the unthinkable. Also we see in this model the means for machines to talk to each other which does not appear in Goertzel’s model. Here there are flying bits bounded by the speed of light and so the cellular computational space is relativistic. If we add to their model two active nodes then we begin to see how machines can become social participating in symbolic interactions. The bit stream that was memory

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1.Comm. of ACM Oct 92 v35 n10 p60(14)



becomes the communication channel by which the two machines talk to each other. They do not mention this possibility but it is a straight forward extension of their model. It also explains the difference between the parallel processing in society and in the brain as opposed to the sequential. We noted before the fact that there must be a working backward connected with chunking. Well we see that the sequential virtual machine of consciousness are merely stationary vectors in the spatial machine. Everything that is moving in relation to these stationary vectors is unconscious. They form a reference frame. What is inertial in relation to that reference frame is sequential. So if the whole group is moving at a constant rate it is the same as standing still. Whatever accelerates away or decelerates away is suddenly parallel instead of sequential. Thus the transformation of a chunk from parallel process to sequential has to do with synching it in the same inertial reference frame which means decelerating or accelerating it to stationary. When its position is fixed in relation to the rest of the stationary points it becomes conscious. This gives us a dynamic picture in which there may be many different inertial frames. If we take any one of them then whatever is stationary with respect to it will appear as conscious. This gives us the possibility of multiple locuses of consciousness in the universe of spatial machines as something accelerates or decelerates away it becomes parallel and disappears from consciousness but it may get in sync with some other inertial frame in which case that thought or set of machines will become conscious to this other center of consciousness. This gives a view of how we might have multiple minds and jumping from one inertial frame to another we can jump from one stream of consciousness to another within the same mental structure. The model also allows communication via flying bits between these inertial frames traveling at different speeds in relation to the speed of light. This informational aspect seems to be missing from Goertzel's model although he assures me it is there by the definition of the self-generating component system as a structural transformation system which generates patterns. However, the Feldman and Shapiro model give us the flying bits that can either be memory or communications channels depending on whether one or both of the participants are active. When we add that the machines are general in the sense of Arbib and Manes and self-generating in the sense of Goertzel then we begin to have an interesting model because the computational spatial machines must act as a community to decide who will exist at the next moment and that decision is the category of spatial machines acting back on itself via a functor. That is the definition of self organizing from both directions. Internally they self-organize by producing conspiracies and externally they self-organize by producing an order that they impose as a group will on themselves. Thus we have the rudiments of law. Now

this is approaching a complete model of the relation of computing machines to space which is by its nature social: social in the sense that self-generating component systems must work together to actualize themselves and social in the sense that the category of spatial machines is ordering itself by law as a functor back on itself.

However, we want to go deeper than merely concocting a model of the relation of machines to space which is social in nature. We want to determine the nature of these machines and how their sociality comes directly out of the inner nature of spacetime itself. We want a deep theory of computational sociology that defines minimal social machines in a way that is inherently social not just a matter of their mechanical relations to each other. And this going deeper has to do with lifting the limitation that Feldman and Shapiro impose on themselves of considering only three-dimensional spacetime. We will ultimately move away from this model of three-dimensional spatial machines to higher dimensional spatial machines and by means of that understand the intrinsic nature of sociality as it dwells within spacetime and is ultimately embodied in space time through the presence of minimal social machines.

## 7. Worldmaking

We shall introduce a framework based on worldmaking that will give structure to our exploration of the relation between the social embodiment and spacetime. That framework will be introduced in a series of tables that will be briefly explained. Like the ontological levels in the last part of this study this framework will be used in order to give a context for our work. The framework is itself a network of interconnected nodes appearing in a table that forms a ring. It begins with the Peircian-Fullerian categories folds them back on themselves asking to produce a picture of what they can tell us about themselves. Then the Peircian-Fullerian categories are arrayed against the Methodological Distinctions that embody order and distance. These are then further arrayed against the kinds of correlates that are discovered through distortion and cutting which are Johansson and Husserls primary ways of world making. The types of correlates are arrayed against our Social Science approaches discussed in the first part (phenomenology, hermeneutics, structuralism and dialectics). The social science approaches are arrayed against themselves and then against the Percian-Fullerian categories to produce a full circle. This circle is like a Hermeneutic circle in that one must travel around it again and again to capture the meaning of the diacritically interrelated

elements that appear within it. It is a set of arrays or tables like the tables we used to discover the nature of the ontological levels. But in this case there is a ring of the tables instead of a hierarchy. The ring has two major elements which are reflexive: the Peircian-Fullerian categories and the Social Science approaches that are turned back on themselves. These interact with elements that are drawn from the ways of worldmaking given us by Goodman. Only one way of world making is not represented which is “weighting” which we have related to tendency or propensity. This last way of worldmaking haunts the ring as what lives in the interstices between its nodes. We might weight different elements of the ring differently and that would result in radically different worlds. However, worldmaking is not the only element that exists in the ring of tables. There is the Peircian-Fullerian categories that give us a view of the meaning of synthesis and there are the Social Science approaches that give us radical different ways of looking at phenomena related to society based on distancing

The purpose of this framework is to allow us to focus on the point where Johansson and Husserl’s ways of worldmaking come into contact with the metric properties of spacetime. This is the point where embodiment occurs. However, it is necessarily to have the full apparatus of the ring in place so we can have a full context for approaching the phenomena of embodiment. In order to understand this interface we will start there and work back outward in order to establish the full context.

### 7.1. Deformation and Cutting

Johansson prefers cutting to Husserl’s use of deformation in order to discover the nature of objects within the world. We are committed to using all the ways of worldmaking together as a means of producing a robust ontology. We will cross-relate both of these methods used by Husserl and Johansson and see what that gives us.

*Table 14:*

Intensive	Extensive
Non-deformable	Deformable

Table 14:

Intrinsic	Simple	Manifold
	Can't deform and has	Can deform but has
Slicing	no parts	no parts
does not		
change		
Extrinsic	Skeleton	Body
	Has parts but cannot	Has parts and can
Slicing	deform	deform
changes		

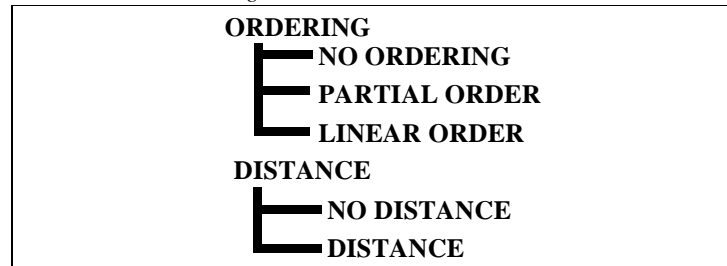
This table immediately reminds us of the relation of body to soul or mind. Classically mind or soul has no parts and cannot be effected by any kind of deformation of the body. Thus without seeking much further we see that there is a basis in our traditional way of thinking about things for at least two of our candidate correlate types. But the typology also gives us two other types we are not so used to thinking about. One is the skeleton which has parts but cannot be deformed. The other is the manifold which can be deformed but has no separable parts. Manifolds are addressed by topological surgery which transforms one manifold into another. But the manifold itself is not effected by deformations because it is in topology defined as that which can be deformed it is only if we cut a hole in it or add a handle or some other surgical procedure that slices the manifold and reglues it that we get a transformation of the manifold. The skeleton and the manifold have implications for embodiment because we usually think of only the body which can be sliced and deformed. We normally do not think of the skeleton and manifold. But of course we have as part of our bodies a skeleton and something like a manifold -- the skin. We also have some part which as Johansson says is coextensive with the body but different from it called the mind or soul. In Old English that was called the Mood which meant a unity of heart and mind. Thus we see that the use of deformation and slicing ways of worldmaking give us a picture of the body that is embodied. But it does not give us a picture of the place in which that body exists. For that we must appeal to two different ways of world making that Goodman mentions.

## 7.2. Order and Composition

Spacetime has two major attributes that we are interested in this essay. One is the fact that individuals of a kind (for instance the kind of the category of machines) are instantiated in it in different places and instants with some kind of continuity of connectedness usually called compactness and some way of moving into contact or of communication between each other across the expanse of spacetime. This is the prerequisite of embodiment. And we can use our way of worldmaking

“composition and decomposition” to identify instances and separate them and ultimately count them and compose them into sets. As a result of composition and decomposition which leads to enumeration and isolation of instances we can consider the distance between any two instances. This is to say that space appears to us primarily in terms of the distance between things.

Figure 29: Order and Distance

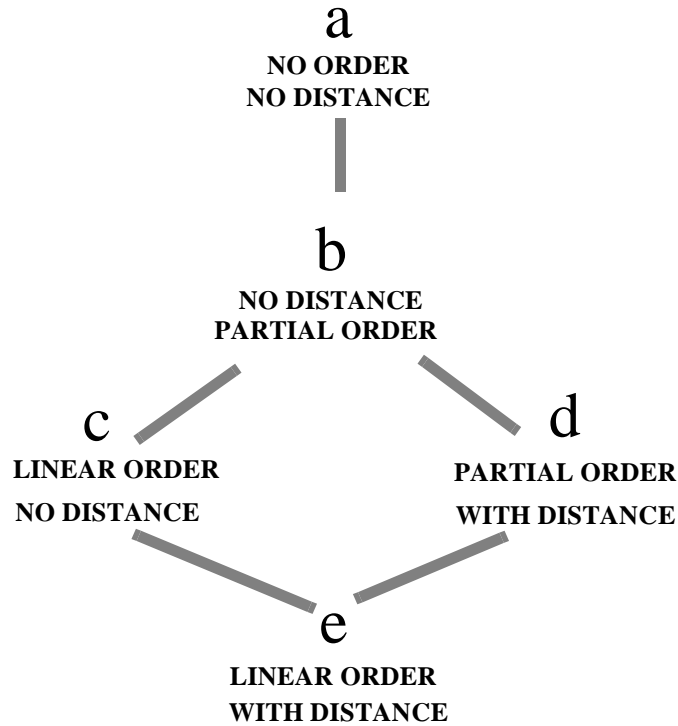


However, we are also interested in another closely associated way of worldmaking which recognizes order and we are interested in the order inherent in space itself. We are going to explore in detail in this essay the relation between things, like minimal machines, and the inherent ordering that spacetime imposes upon them when they appear as instances embodied within it. The discovery and explication of the inherent ordering of spacetime has a long history beginning primarily with the Greeks and leading to the development of modern mathematics which is differentiated into many different mathematical categories. Our main task is to look at some of this work already accomplished in a new and different light.

Figure 30: .Methodological Distinctions

Our journey will begin by exploring what Klir calls the basic methodological distinctions that posit the different kinds of order and expressions of distance that variables may take. We are looking at the possible combinations of orderings and distance within space as might be expressed in variables. As Klir points out there are basically five different possible kinds of order that the data in a variable might have. There may be no order, partial order or linear order. There may either be distance or not and these combine to give the five kinds of methodological distinctions mentioned by Klir in *Architecture of Systems Problem Solving (ASPS)* and show in the figure.

We are interested in composing a general systems theory upon which to layer our specialized systems theories concerning dissipative systems, autopoietic systems and reflexive systems. So to produce this general systems theory we will work



thought the list of methodological distinctions one at a time. But before we do that we will establish the general context with our ring of tables that forms a self-grounding network of the kind Rescher describes in Cognitive Systematization. This context begins with the interaction of the metric of spacetime and the types of correlate. But first let us take note of a few points.

First the metrics apply to variables used to describe anything that appears in spacetime not exactly to spacetime itself. Our metrics take account of the fact that spacetime itself may have a nature beyond what we can measure but as Klir points out every system must have backgrounds and attributes identified in order to be measured. The backgrounds are turned into support variables. What ever we measure in a system in measured in reference to be backgrounds. Time and points in space are primary candidates to be considered as backgrounds that can become measurement supports. Only globally consistent metrics with respect to the system under study are considered for this role. We will only consider measurement that has reference to a system or some other correlate and not consider any direct measurement of spacetime itself because we believe all measurements to be relative. The nature of the thing measured is described by the types of correlate. Thus in our study of the metric nature of spacetime we are reducing that to the possible metric structures of any variable. Thus our results are applicable to any variable by which the system is measured including both normal system variables

as well as support variables.

Second the methodological distinctions describe the locus of embodiment. Thus our gaze is riveted on not the body or the other correlate types but on the locus in which embodiment occurs. Embodiment is only idealized without this locus in which embodiment occurs being spelled out in detail. Thus we will concentrate on each level of the locus of embodiment more than on the body itself. I think this is a point on which this study of embodiment differs from previous known studies. We look out from the body toward the immediate locus in which embodiment occurs to see what the possibilities for each body are yet we do not look at spacetime itself directly but only at the potential for order and the expression of distance in variables. So you see we are limiting our gaze to the schema through which we understand spacetime and not looking at spacetime itself. We are turning away from looking at the body toward the metric that is projected around the body. This limitation is a very important strategy decision for this study which must be clearly understood by the reader in order to get the gist of what follows.

### **7.3. The locus of embodiment: Table A**

The table which discusses the methodological distinctions related to the correlate types is the focus of this section. Here we see that as we ascend the levels of methodological distinctions we get different manifestations of the correlates. Simplex appear as instances, sets, complexes, and fields. Skeletons appear as nodes, lattices, networks, and arrays. Manifolds appear as plenums, clouds, constellations and continuity. Bodies appear as schema, assemblage, construction and machines. Note that we work our way from the simple with no order and no distance that appears as instances to the body that is deformable and sliceable in an ambiance that is fully ordered where we can posit the existence of a machine. So a machine needs fully ordered spacetime to exist in. There is a range of positions between these two extremes and we have suggested some names of these intermediate positions. All these names are tentative and meant only to be suggestive of the kind of things that might appear in the cells of our table. The important thing is the overall construction of the ring of tables and the suggestion of their mutual implication.

It should be noted that embodiment actually occurs between these two combinations of the ways of worldmaking. This is the point of our positing the level of embodiment in the generic explication of the ontological level. You will notice that each aspect of the ways of worldmaking have an inherent connection to

Being. We posit that even the weightings that haunt this interface as tendencies and propensities exist in relation to the uttermost kind of Being. But embodiment itself occurs in relation to spacetime itself not its metric as a how which encounters dirt and limits. We cannot deal conceptually with something that lies beyond Being so we concentrate on the metric as the closest thing to the a-social context of the social machine. But that contact between spacetime itself which is posited to have a social infrastructure and the social machine occurs in the interstice between the methodological distinctions and the types of correlate. Any one type of correlate only exists in relation to a particular metric level at a time so each cell in the lattice represents one of the possible interactions. So if we pick one, say the constellation, then we see that the constellation is the effect of either linear order or partial order with distance on the manifold. Now that describes the correlate in its metric space but only hints at the nature of its embodiment we would still have to ask how is it embodied to discover its Way of embodiment. That Way is a particular manifestation of Li and Chi. It has specific limits and encounters particular forms of dirt or resistance. Also that constellation will embody certain specific weightings that connect it to the tendencies of Wild Being. Embodiment is the interface between the nether most kind of Being and the splitting which obscures our view of Primary Process. But we will not delve into this interface since it is conceptually obdurate. Instead we will look deeply into the methodological distinctions which are our gloss on the metric aspects of spacetime as they embody order and distance.

#### **7.4. Metric and Peircian-Fullerian Categories: Table B**

As we move away from the locus of embodiment we see next how the metric aspects of the variables that describe spacetime and other things in spacetime interact with the Peircian-Fullerian categories. We see things embodied in spacetime in terms of either Firsts, Seconds, Thirds or Fourths. Each of these are a gloss on the actually embodied phenomena that distorts it. We will not delve deeply into the table representing this interaction because many of the elements what appear in it will be explored along our journey. But notice that we are moving in this table from the independent isolated elements where no order and no distance intersect with the category First toward a minimal system of viewpoints where Full order intersects with the category Fourth. The minimal system of viewpoints expresses the different possible ways of considering any real-time system. The viewpoints are specifically Agent, Function, Data, and Event. These are taken from our study of real-time system design but have general applicability to the description of any system. Notice that there is a single viewpoint called the Catalyst in the cell where the Fourth intersects with no order and no distance



methodological distinction. Thus we see a development in which a single viewpoint becomes a minimal system of viewpoints. If we add the minimal system of viewpoints to the machine derived in the last table then we have a machine that can take views of different kinds of any phenomena including itself. Note also that in the other corner of this table there is a position in spacetime where Full order intersects with the First. This is due to the fact that any movement that is four pi (circles around twice) can describe a fixed point in spacetime. In spacetime you have to be moving to stand still. Looking across the table from the single undifferentiated viewpoint toward the independent isolated elements at the level of no order and no distance we see that Seconds and Thirds are undifferentiated and refer to internal relations and significance only. As we move up the levels of the methodological distinctions we eventually get to the point where instances can be seen as positions in spacetime and the whole cluster of firsts can be seen from a set of differentiated viewpoints that can see it in terms of agency, function, data, and events. At this level there are specific embodiments of data and event within the full continuous body of metricized spacetime. The other aspects of this table will not be explained at this time but as we encounter them in our journey. The important thing here is to realize that there is an important interface between the metric aspect of spacetime and the four levels of synthesis of correlates as expressed by the Peircian-Fullerian categories.

#### 7.5. Peircian-Fullerian Categories Cross-related: Table C

When we consider the Peircian-Fullerian categories on their own we can see them as interacting with each other. This gives us an interesting set of cells in this new table. Each of the cells along the diagonal represent the interaction of a category with itself. We see utterly isolated phenomena which is a First upon Firsts; then we see the relations between relations which is a Second upon Seconds; then we see the significance of significance which is a Third upon Thirds; and finally we see the synthesis of syntheses which is a Fourth upon Fourths. Each of these exemplify a kind of reflexivity. The utterly isolated phenomena is representative of what is called the ephemeron and the synthesis of syntheses is representative of what is called the Holoidal. These are two aspects of Being within the Indo-European tradition. The complete derivation of these aspects of Being is given in my book<sup>1</sup>. But briefly the derivation goes something like this. In the Greek language there is a fusion of three substantially different meanings under the rubric of Being: Reality, Truth, and Identity. If we permute these aspects we get a structure called the

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1. See The Fragmentation of Being and the Path beyond the Void.

Trigrams of Being which show us the complete set of possibilities for the expression of Being in its Primordial form. These trigrams of Being are produced by permuting the three different sub-meanings and their opposites to produce eight different possible interactions. All the negative meanings are brought together in the ephemeron and all the positive meanings are brought together in the Holoidal. The holoidal is the lost wholeness that is always striven after in the Indo-European tradition and the Ephemeron is the feeling of utter emptiness that always plagues us when we do not experience wholeness. These two are nihilistic opposites one too light and the other too dark. They define the field through which the Western tradition continually oscillates. The other aspects of the field are named: Essencing, Eventivity, Novum, Epoch, Integra, Holon. These will not be explained here. The key point is that when we take the Peircian-Fullerian categories and relate them to themselves bringing out their reflexive nature we get a structure related to the inner structure of Being itself. Thus we know that we are at this point fully under the auspices of Being working itself out in its core set of possibilities. Notice that the already mentioned duality between vectors and category theory appears within this field. Other than that we will not attempt to give a more definitive definition of the cells of this field at this time. It is meant to be a suggestive sketch that connects us to the inner workings of ontology and shows the efficacy of using the Peircian-Fullerian categories as a bridge to the phenomena from within Conceptual Being.

#### **7.6. Social Science Approaches and Correlate Types: Table D**

Moving away from the locus of embodiment in the opposite direction we see that each kind of correlate can be viewed in terms of each social science approach. This should be obvious from what was already said in the first part of this study. Each approach will see something completely different in the phenomena. Each one relates to a different aspect of the simple and ends up translating the body in different ways. The same is true of the skeleton and the manifold. It is clear that this must be the case because inner distancing of the observer from the phenomena can take different forms whereas outer distancing may only take one form. But outwardly there are four different viewpoints on the system that correspond to these inward approaches. Both require distancing but they have different bases. The four viewpoints are more physicalistic whereas the social science approaches are means of access to the social or to consciousness. Thus the four viewpoints mentioned before consisting of Agent, Function, Data, and Event establish the workings of the machine whereas the approaches give us access to its social nature. These work together to give us a complete view of the different aspects of social machines. The physical and social approaches give us different ways of accessing social beings for

our studies. They are complementary need not necessarily be in conflict.

### **7.7. Social Science Approaches Cross-related: Table E**

We can do what we did with the Peircian-Fullerian categories and relate the social science approaches to themselves as well. When we do that we get likewise reflexive structures but of a different nature. Here along the diagonal each approach is applied to itself and in the rest of the table they are all applied to each other. This naturally occurs when the social science approaches turn in on themselves usually out of self-doubt about their scientific worthiness. Sartre's Critique of Dialectical Reason is the only major study of the Dialectic which applies the dialectic to itself. Ogden and Richards have a famous study called The meaning of Meaning. Foucault's the order of things can be seen as an attempt to give a structural account of the development of structuralism. Phenomenology normally considers instances of thought thinking about itself in fact this all started with the reflexive philosophy of Descartes who could not doubt his own thoughts but managed to doubt everything else. Reflexivity in the social sciences themselves is of course our first point of departure for understanding reflexivity in society itself. In fact our own social reflexivity can take exactly these same forms so that reflexivity in our social sciences are a manifestation of the root reflexivity of society itself. Thus we can look at this table and see all the permutations of the interaction of the reflexivity in the object of study as well as in the means of study of society.

### **7.8. Social Science Approaches related to Peircian-Fullerian Categories: Table F**

We relate our highest and lows table with a final table that takes our two sets of elements that may exhibit reflexivity and relates them to each other. Here we see in the column of Fourths several different manifestations of essence perception cum abduction. These exist against the background that ties content to form through the mediation of something like the noematic nucleus. Thus the whole infrastructure of ideation stands opposite the locus of embodiment. Looking back at our generic format for the ontological levels we see that the mechanism of the fragmentation of being comes between ideation and embodiment layers in our model. We have seen that the Peircian-Fullerian categories intersect with the Social Science approaches at the level of ideation. They are clearly manifestations of ideation. They along with the rest of the tables we have considered stretch around the mechanism of fragmented Being to approach the locus of embodiment.

**Table 15: Peircian-Fullerian Categories Cross-related: Table C**

	<b>First</b>	<b>Second</b>	<b>Third</b>	<b>Fourth</b>
First	utter isolation, ephemeron	establish relations	vectors; magnitude plus direction	one viewpoint projecting on pure content.
Second	establish relation	relations between relations	third as a side-effect of a relation	mathematical categories as arrow and set
Third	vectorial position via calculus	third as an origin for the duality	significance of significance	partial synthesis to full synthesis
Fourth	Four viewpoints view one position	mathematical categories as category and functor	full synthesis to partial synthesis	synthesis of synthesis; holoid

**Table 16: Piercian-Fullerian Categories related to Methodological Distinctions: Table B**

	<b>First</b>	<b>Second</b>	<b>Third</b>	<b>Fourth</b>
no order, no distance	independent isolated elements.	internal relations only	internal significance only	Catalyst viewpoint
partial order, no distance	nodes in a lattice	lattice 1-4-6-4-1	duality mapping to lattice from both directions	ends of lattice; two viewpoints
linear order, no distance; partial order with distance	temporal gestalt causa sui	minimal methods	reduced machine (a+b+c-d)	turing machine
Full linear order with distance	position in spacetime (4pi)	data and event embodiments	full continuous spacetime	four viewpoints

**Table 17: Methodological Distinctions Related to Correlate Types: Table A**

	<b>simple Exclusive Intensive</b>	<b>skeleton Inclusive Intensive</b>	<b>manifold Exclusive Extensive</b>	<b>body Inclusive Extensive</b>
no order, no distance	instances	nodes	plenum	schema
partial order, no distance	sets	lattice	cloud	assemblage
linear order, no distance; partial order with distance	complex	network	constellation	construction
Full linear order with distance	field	array	continuity	machine

*Table 18: Social Science Approaches Related to Correlate Types: Table D*

	<b>Simple Exclusive Intensive</b>	<b>Skeleton Inclusive Intensive</b>	<b>Manifold Exclusive Extensive</b>	<b>Body Inclusive Extensive</b>
Phenomenology	intuition	consolidation	disfigure	transform
Hermeneutics	semiosis	reification	dissonance	transsignify
Structuralism	discrimination	crystallization	distortion	transmute
Dialectics	grounding	hypostasis	disintegrate	transduction

*Table 19: Social Science Approaches Cross-related: Table E.*

	<b>Phenomenology</b>	<b>Hermeneutics</b>	<b>Structuralism</b>	<b>Dialectics</b>
Phenomenology	Reflexivity; thought thinking about itself	Seeing the meaningful thing	Seeing the discontinuities	Seeing the part-whole relations
Hermeneutics	The meaning of seeing	The meaning of meaning	The structure of meaning: syntax	Part-whole relations among meanings
Structuralism	The structure of seeing	The meaning of structure	The structure of structure: deep structure	The structure of the dialectic
Dialectics	The dialectic of seeing	The meaning of the dialectic	The dialectic of structure	Dialectical dialectics as in Sartre's Critique of Dialectical Reason.

*Table 20: Social Science Approaches Related to Peircian-Fullerian Categories: Table F.*

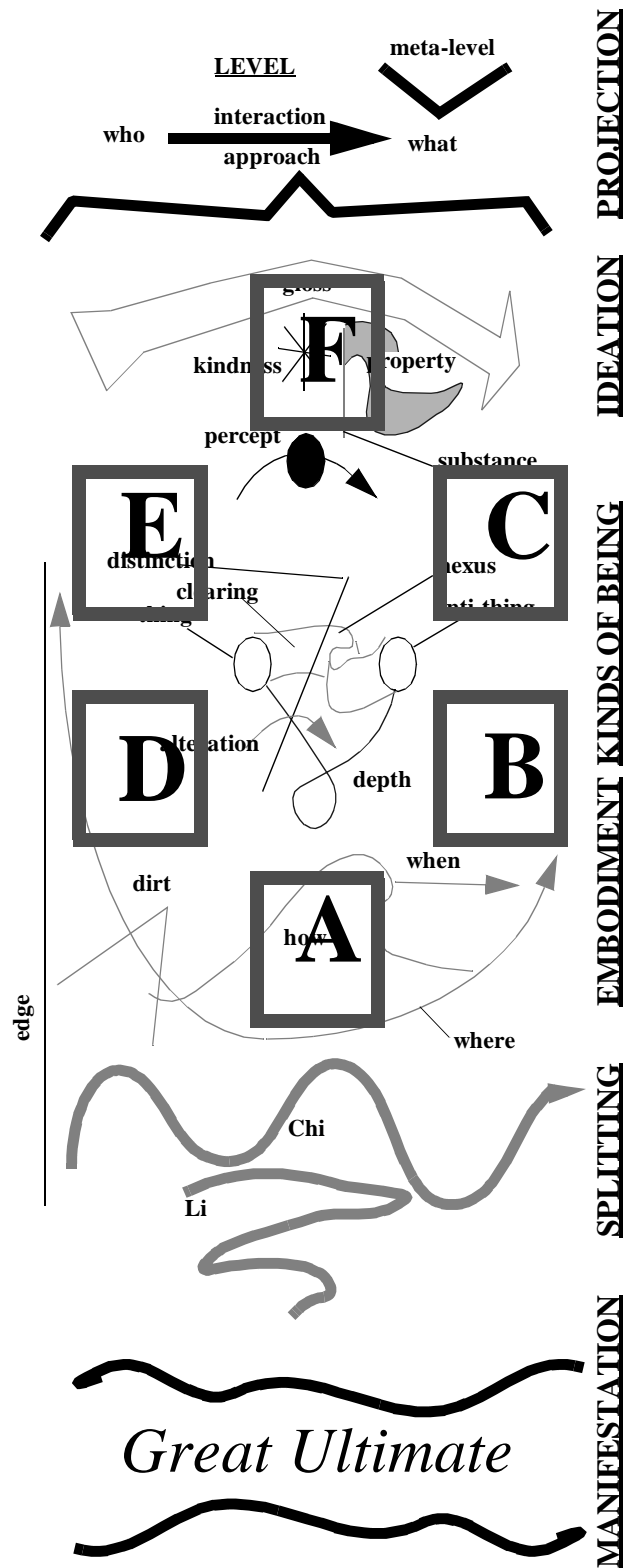
	<b>First</b>	<b>Second</b>	<b>Third</b>	<b>Fourth</b>
Phenomenology	sensory content	noematic nucleus	idea	essence perception
Hermeneutics	gramme; text	signs	symbol	relevance; significance
Structuralism	formal content	content categories	form	natural complex
Dialectics	parts	contradictions	whole	detotalized totality

## 7.9. The Ring of Tables

This ring of tables gives us a background from which we can pursue our studies of embodiment. It gives us a basis for cognitive systematization which continually goes round the ring as if we are in a Hermeneutic spiral. We are concentrating on the phenomena of embodiment as it is mirrored in our notion of the metric of space. We shy away from directly using social science approaches but attempt to stick closely to the physicalist projections in order to show the social aspect of emergent phenomena in its most bare or minimal form. This is not because we wish to reduce the social to that level but because we want based on our social ontology to project a theory of social machines that relies on the structure of the metrics of spacetime. Once this is shown then the full panoply of social science approaches may be used without further embarrassment or self doubt. If the social is inscribed into the intrinsic ordering of our projection of spacetime then the social cannot be reduced. We see the social in Bells Theorem in a proven spooky action at a distance. But more than just being in one or two strange physical phenomena we want to prove the ubiquity of the social by showing its embedding in the structure of spacetime itself at the first level that we can catch hold of it with our concepts. That level is the level of embodiment which is below the projection of fragmented Being but above the level of the splitting of Li and Chi. By constructing a framework we are able to focus on the phenomena we wish to study in a way that we could not do otherwise. Our framework gives our studies a foundation even if it is not based on ultimates but floating within the levels of abstraction away from Primary Process. We use that foundation as a basis for exploring the different levels of the metrics possibilities for variables expressing spacetime relations or any other quantity relating to some system within spacetime.

# Reflexive Autopoietic Systems Theory

Figure 31: Tables A through F projected on generic ontological level.



## 8. STAGE ONE

### 8.1. Things

We begin by considering the first methodological distinction which has no order and no distance. It is of interest that at this stage only two Peircian-Fullerian categories appear to apply which are the First and the Fourth. The eventivity as a First appears as totally isolated from everything else with no relations, no meaning and no synthesis. Or the eventivity can be seen as a viewpoint which we will name the Catalyst viewpoint which is by definition a Fourth. We notice that the Catalyst viewpoint may be envisaged as the intentional morphe of Husserl and that the eventivity as First is the pure hyle dominated by this Fourth. Thus what appears at the first stage is exactly the basic abstractions that Husserl took as primitives for his Phenomenological project. Seconds and Thirds if they exist at all only appear as internal relations or internal significances within the eventivity as First or the eventivity as Fourth. It is important to remember Nietzsche's dictum that subjects are objects turned inside out. So the isolated eventivity as object can be seen as the outside of the viewpoint whereas the viewpoint is the inside of the isolated eventivity. Thus we have from the very beginning the problem of embodiment of the mind. The eventivity is the body of a simple which as Johansson says coincides with it in space. That body may be seen as having a manifold and skeleton. Through the manifestation of the simple the body goes beyond itself and overflows ecstatically into spacetime and other beings. Another important dictum is the distinction that Heidegger makes between object and thing. The subject/object dichotomy is a reification and beneath that gloss there is the thing that *things* as an event which is prior to the subject/object dichotomy. We can go deeper than Husserl's intentional morphe and the hyle it dominates by realizing that the eventivity considered as First or Fourth is primarily a thing. Heidegger appeals to the etymology of this word to point out that a "thing" is a gathering together. So the *thinging* of the thing is its gathering. We may go further and point out that the "thing" was a social gathering. Thus prior to the appearance of the reified subject/object there is a social foundation in the gathering together either as isolated eventivities or as primal viewpoints. The isolation of the First is seen as a separation of what was gathered. The appearance of the primal viewpoint manifests from the social gathering and is only as a derivative moment isolated in the individual. Thus we see that to get the hyle and the intentional morphe one must break the original fundamentally social gathering by applying separation. Separation allows us to see isolated eventivities and isolated viewpoints. But before that application of separation there was the gathering that was inherently social and in which the individual bodies and individual viewpoints



were not yet broken apart. We were surrounded by things *thinging* and that did not distinguish between the people and the non-people that participated in that gathering. That gathering was the cumulative projection of a world. In that gathering there was no distance and no order. All relations and significances were internal and not external. We notice that the projection of First and Fourth on it is a destructive move that applies separation to the gathering. Breaking apart the separate eventities and giving some of them viewpoints on the others. Thus as Deleuze and Guattari say there is a level at which humans and machines cannot be distinguished, that is prior to that distinction so that we can consider people as constellations of desiring machines. This is another way of saying that in the Thing the people, animals, and cultural objects along with the natural objects are all of a piece and not differentiated. All of them are “things.” We still understand that level of generality but have lost the sense that the thing is a gathering within which all things are gathered and that it is primordially social. The social is a simple, like the mind or soul, which is coextensive in spacetime with the eventities that embody it. The fact that all the things are gathered together in the Thing is made possible by the projection together of a world. Everything acts together to reinforce the projection of that world. So when we find a Skythian artifact we have a fragment of the Skythian world. We have lost almost everything else from that world including all the people who inhabited it. But we can see in the artifact, as if it were a piece of a hologram, a reflection of many aspects of the Skythian world. It is a thing which expresses the gathering of all the things of the Skythian world which was essentially a social Thing. So from the very beginning we affirm the social foundation of everything when we see how in the first methodological distinction where there is no order and no distance there is instead a gathering which is essentially social in nature. Out of this gathering comes the reification of individual isolated eventities and viewpoints. These appear through a process of separating the gathered. The application of separation produces a plenum of pure distance within which eventities are distinguished and that viewpoints oversee.

Let us assume that the eventity considered as First appears as a minimal system in B. Fuller’s terms. That is the eventity appears as overlapping in time and within the same purview in space as four eventities. We do not have to assign relations to these four eventities and derive significations but we can merely apprehend them within the compass of a single viewpoint. That viewpoint is the Catalyst. If we see the eventities as desiring machines in Deleuze and Guattari’s terminology then this Catalytic viewpoint is what they call the body-without-organs. For them there is a positive twin to the Essence of Manifestation (Michael Henry’s ontological version

of the unconscious). That positive twin is a cornucopia from which flows endless variety of forms. They speak of intensity zero of the body-without-organs being the practico-inert or matter. The intensity may increase from zero almost infinitely and as it does so a variety of forms spill out of the body-without-organs. As it approaches infinity we get schizophrenia which is the fundamental Dionysian social patterning. The gathering of the Thing has a positive feed back that feeds on itself constantly increasing intensity and that spiraling intensity leads to extreme variety production which is ultimately seen as madness. It is only through repression that this fundamental substrate of madness, or chaos, is defused and subverted by turning it into a semblance of reason. As everyone knows reason has an irrational basis. We can find reasons to justify anything. It is the tendencies or desires that drive us to one set of reasons rather than another that are the basic phenomena beneath the veneer of rationality. So understanding the Catalyst viewpoint is very important. It is a cornucopia of the unfolding of a myriad of forms projected on the passive content of the isolated eventities. It is a primal viewpoint in that it is very close to the groupview of the Thing. Yet it has been broken off from the Thing through an act of separation that places it within individuals within the group. One might say that it is a Catalyst because the minimal system of eventities spontaneously organize into myriad patterns in the presence of this viewpoint. We see to take Deleuze and Guattari's metaphor the different desiring machines hanging on the body-without-organs like medals hanging on the chest of a decorated general. Each desiring machine is orthogonal to all the others and springs independently from the unconscious. These are patterned like a Kaleidoscope constantly changing and introducing extreme variety. That variety production is the work of the Catalyst viewpoint, the positive aspect of the body-without-organs. We call the upwelling of that order *physis* if we relate it to all things or *logos* if we relate it only to words. We can say that the eventities in this case can be the components of the self-generating component system. The order is the rules by which they generate magicians and anti-magicians. The self-generating components may be viewed as desiring machines. The essence of manifestation is the rift between moments in time across which the components have to jump by generating a new cortege. The set of self-generating components of time zero hang off of the uniform of the Essence of Manifestation appearing as the gap between presentations. The self-generating components form endless patterns of variety which as the intensity increases approach madness. These patterns are the work of the Catalyst viewpoint continuously rearranging the components and ordering their production of magicians and anti-magicians. When the new cortege is produced then it hangs off of the Essence of Manifestation as well like medals off a soldiers

vest. The persistent patterns and persistent components are accounted for by a conspiracy between components. But the source of that conspiracy must be the Catalyst viewpoint. When we bring the catalyst viewpoint together with the minimal system of eventities we get spontaneous generation of distance and order. The Catalyst viewpoint holds the elements of the minimal system in a single viewpoint and projects patterns on those elements or allows patterns to spontaneously appear. But we see that the Catalyst viewpoint is the opposite of the Essence of Manifestation. One is a black hole of what never manifests but disorders everything that does manifest. The other is a white hole of the high intensities of the body-without-organs which constantly spews forth order through variety production. But order must be order of something. Thus the ordering of the Catalyst must be projected on the minimal system. Order and distance arise together out of this fateful interaction. We note that it is the cancellation of the Essence of Manifestation with the Catalyst viewpoint that gives us the basic aspects of Wild Being just as the cancellation of Process Being and Nothingness gave us the basic aspects of Hyper Being. So the building blocks of our conceptual schema place us at the edge of Wild Being which is where we must continually hover in order to produce a correct picture of the social basis of our systems theory. What occurs in the interaction between the Essence of Manifestation and the Catalyst viewpoint? In the cancellation between these the tendencies are born. They are both just the opposite ends of the body-without-organs. The Catalyst is where it approaches intensity infinity whereas the Essence of Manifestation, unconscious, is where it approaches the intensity zero of the practico-inert (matter). “Matter” is merely another name for the dark matter of consciousness. Like the universe we know that there must be lots of dark matter out there because when we look at our own solar system we see lots of dark matter floating about. The practico-inert is the embodiment of all the unconscious aspects of things. The interaction of consciousness with the unconscious is the simulcrum of the interaction of consciousness with the physical world. Both embody a waywardness or intransigence that makes idealists shudder.

When we go back beyond the subject/object dichotomy to the thing we enter a region in which the ways of worldmaking are not differentiated from each other. The Thing and the world projected by it are a single unhewn matter. In it there is no order, no separation, no distortion, no slicing, no weighting. What there is what Ballard calls the Archaic. There is an unhewn worlding of the world. That worlding of the world as Heidegger tells us consists of the fourfold: heaven, earth, mortals and immortals. The fourfold participates in a mutual mirroring which is

like a round dance. This fourfold is a reflection of a single universal way of worldmaking which the Chinese called the Way (Tao). When the Way is shattered it gives rise to the fourfold. The fourfold is a way of worldmaking that is unique to the Indo-Europeans. The fourfold opens up a clearing within which things may appear. But this positive fourfold stands opposite a negative four-fold that is always forgotten. The negative fourfold includes chaos, covering, night, and the abyss. These two fourfolds are the root of our world. The difference of the negative fourfold to the positive is that it preserves in itself non-transgression whereas the positive fourfold embodies transgression. Both of these fourfolds arise out of the Way to define the clearing within which the unhewn things abide. But the clearing is not all transparent. There are darkneses within the clearing which are the embodiments of the aspects of the negative fourfold. When we hew the things turning them into objects and subjects then the ways of worldmaking differentiate from each other. Separation is applied to the gatheredness of the things within the clearing. Eventities are separated from the gathering of the Thing as are the viewpoints that oversee the eventities. We find ourselves differentiating the five ways of worldmaking and playing them off against one another. We find ourselves differentiating the Peircian-Fullerian categories and the Social Science approaches and playing them off against themselves and each other and against the ways of worldmaking. We find ourselves constructing the network of tables already presented as a way of articulating the world. But what we want to do is to poise ourselves not in the unhewn of the Thing suspended between negative and positive fourfolds or within the hewn differentiated world of the network of tables; rather we wish to take up a position which is rough hewn at the point where the differentiation begins at the level of the first and second bifurcations of the unfolding of the world. Because we see that in the rift between the tables of the two pairs (deformation/slicing verses order/distance) of the ways of worldmaking is where the weightings appear. We need to explore what appears in this rift because that is where embodiment occurs. The embodiment is the transformation from the thing suspended between negative and positive fourfolds into the eventity exist in a space of order and distance and can be manipulated by deformation and slicing. That eventity is a bundle of weightings or tendencies or desires. Through progressive reification it is turned into a desiring machine. It finds itself suspended between the Catalyst viewpoint and the Essence of Manifestation which are the two poles of the body-without-organs. The bifurcation of the ways of worldmaking is like the turning inside out of the Thing. The positive and negative fourfolds become hidden and are replaced by the two horns of the body-without-organs. We lose track of the inherent social nature of the Thing. That social nature becomes reduced to the Id

(it) of the unconscious. It appears as the Catalyst viewpoint when it gains intensity eventually reified into the generalized other. Finally we get an image of the self-generating component system which are dispersed chaotic processes up against the wall of the Essence of Manifestation (the ontological unconscious) and full of the orderings that appear spontaneously as an effect of the presence of the Catalyst viewpoint. If we de-reify we see that the whole set of chaotic self-generating processes are a Thing that is suspended between positive and negative fourfolds. If we de-reify we see that the bifurcation of the ways of worldmaking collapse back together into a single Way. On this border between reification and de-reification we see the weightings appear as the essential chaos that determines the bifurcation. As was discovered by Feigenbaum bifurcation is ordered. Bifurcation occurs at specific points in the unfolding of chaos. At the first bifurcation point the table of order and distance separate from the table of distortion and slicing. Between them the weightings or the values of the chaotic substrate become apparent. At the second bifurcation the difference between the Peircian-Fullerian categories and the Social Science Approaches becomes apparent. This is to say that the split at the level of the ways of worldmaking produces a further split at a methodological level. But by that time things have degenerated into ideational reflexive forms. Our focus must again and again return to the rough hewn point of bifurcation at which the chaotic basis (weightings or tendencies or propensities or desires) of social process manifests between the two tables that permutes the other ways of worldmaking.

This vision of the social basis of the world which appears in the gathering of the Thing between negative and positive fourfolds that induce the clearing within which the world arises has deep implications for our understanding of systems. We posit that the first stage in the unfolding of methodological distinctions that there is no order and no distance. We posit that at this first stage perhaps we have not differentiated deformation from slicing so that we have not identified the kinds of things that can be measured as simple, skeleton, manifold, and body. Here we see eventities that arise together in minimal systems but have no intrinsic relations to each other and do not generate any significances but come under the gaze of the Catalyst viewpoint which acts as intentional morphe projecting on the hyle of the eventities. The utter isolation of the eventities from each other is the Essence of Manifestation which they emerge out of momentarily completely orthogonal to each other and independent in every way. In the self-generating system this surface of isolation is turned into the rift between moments. The catalytic viewpoint is turned into the internal ordering of the self-generating components that allows them to have conspiracies. We see here dual presentations of the same basic elements.

They are the fragments of the Thing shattered and having lost its essential social aspect. This is necessary because the social aspect is the gathering itself. Once we apply a radical separation to the Thing which produces the isolated eventities and the Catalyst viewpoint an objectified scene appears and we are subjected to that scene. Sociality is gatheredness and this is exactly what has been lost. But it lives on and haunts that scene as the weightings, tendencies, propensities of the chaotic and mad that is the basis of the objectified social project. The project is to put *things* back together into a whole again. The shattering of the Thing produces this insanity as a substrate that is always present at the basis of the objectified and subjected view of reality. What is sane within the gathering of the thing becomes unbalanced once the bifurcation begins to occur and the bifurcations eventually lead to complete chaos. That complete chaos, artificially induced is reality and the model of reality is war. The splitting of the Thing step by step leads to utter chaos. In the Thing everything belongs together and are the Same. Once the Thing is split we get the advent of identity in which each eventity is self-identical which is the badge of its isolation. Finally with the splitting of the Thing truth differentiates into separate kinds of truth for each kind of Being. There is the truth of the collective unconscious identified with Wild Being, the truth of the subjective unconscious associated with Hyper Being, the truth of manifestation connected with Process Being, and last of all the truth of verification and correspondence linked to Pure Presence. Where the Thing has a Primordial Being in which Truth, Reality and Identity play against each other creating the eight trigrams of Primordial Being (holoid, holon, integra, novum, epoch, essencing, eventity, and ephemeron); when it is split we enter the realm of fused Conceptual Being in which Truth, Identity, and Reality separate and produce the nihilistic landscape of reified objectification and alienated subjugation. We posit that the Thing has as its aspects internally those identified with the trigrams of Primordial Being as it displays higher and higher levels of harmony within itself. Chang has identified these levels of harmony as strife, logical consistency, interaction, mutual support and interpenetration. The ephemeron is the lack of harmony or strife. The essencing and eventity have logical consistency as the most basic kind of harmony. The novum and epoch display the next level of harmony of interaction. The holon and integra display the harmony of mutual support. The holoid displays the highest kind of harmony which is interpenetration.<sup>1</sup> By differentiating Primordial Being from Conceptual Being in which all these distinct elements of Being are fused while Identity, Reality, and Truth are cut asunder we are able to get a vision of the difference between the Thing

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1. This is more fully explained in [The Fragmentation of Being and the Path Beyond the Void](#)

and the scene that occurs after the shattering of the Thing. We note that the Thing is merely another name for Purusa, or Prajnapati, or Yamir -- the cosmic man cut asunder by the Indo-Europeans as a means of constructing their world. The cosmic man is inherently social because it is a projection of the community on the cosmos. The destruction of the cosmic man allows all the separate things to appear in the clearing of the world. His blood are the rivers, his skin is the earth, his bones are the rocks, etc. This cosmic sacrifice present in all strains of Indo-European myth also creates a world that is empty of meaning and where intentions continually go astray. It produces a nihilistic landscape of strife in which all harmony has been annihilated. The Indo-European project is to put the big man back together again through the reenactment of the sacrifice. Sacrifice takes an animal -- the highest sacrifice takes a horse or man -- and destroys their unity. In this act a glimpse of primordial unity is produced -- a moment of harmony artificially produced through anti-production within the nihilistic landscape created by the original sacrifice of the Big Man.

In our theorizing we stand right at the rough hewn point between the unhewn and the completely hewn where the first bifurcation occurs -- the death blow of the sacrifice. We note that once that blow occurs the harmony of the Thing is converted into the substrate of madness that haunts the objective/subjective universe. This madness must from then on be repressed constantly by social institutions. We live in a an objective/subjective world that has lost its gatheredness its inherent social nature. In that world we envisage ourself as things which either can or cannot be deformed or sliced. In that world we envisage the place in which we dwell as being composed of orders and distances. Between these we feel the weightings that speak of the underlying insanity that haunts the nihilistic landscape. We continually harken back to the Thing in which we imagine harmony being embodied -- the utopia that we project based on the Principle of Hope<sup>1</sup>.

The catalyst viewpoint can project onto the isolated eventities based on each of the social science approaches. We can substitute phenomenology, hermeneutics, dialectics, structuralism or some combination of these. In each case we get a different set of relations and significations drawn out of the eventities. The social science viewpoints differentiate the Catalyst viewpoint on the minimal system of isolated eventities. Thus seeing the Catalyst viewpoint as the intentional morphe following Husserl in his phenomenology is only one possible interpretation.

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1. See Ernst Bloch

Instead we can view the Catalyst viewpoint as the flowing of meaning into the world and see the generation of significances. Or we can see the Catalyst viewpoint as producing variety by causing structural discontinuities between forms. Or we can see the Catalyst viewpoint as creating part/whole relations between things within the world. All of these social science approaches become possible as interpretations of the action of the Catalyst viewpoint on the minimal system of isolated and independent eventities.

However instead of applying the Catalyst viewpoint to isolated eventities we can see these same eventities as embedded in the Thing. As such we see the Thing as founded on the bedrock of strife or the ephemeron. This bedrock of strife is the realm of the shattering of the Thing itself. The Thing encompasses its own shattering. But within the Thing there are higher levels of harmony that arise out of the Strife within the nihilistic landscape that arises from the shattering of the Thing. The first level makes the eventity as an isolated individual appear in relation to other eventities. Each eventity has its own essencing forth as a kindness. The kindness of essencing combined with the separation into an identifiable gestalt gives us the basis for logical consistency as the most basic kind of harmony. At the next level of harmony we see the novum and the epoch. The novum is another name for the emergent event. The epoch is the temporal gestalt in which a particular paradigm, episteme or interpretation of Being persists. The novum is what shatters this organization and institutes a new organization. As we have said before this adaptation to and generation of emergent events is what defines the social nature of the Thing. This is the level of interactive harmony where regimes of interactive organization appear and persist and then are shattered by the arising of the genuinely new. At the next level we have the holon and the integra. The integra is the coherence of the eventity beyond its kindness as defined as its essence. The holon is the integration of part/whole relations within the holarchy of the eventity. Here we get the harmony of mutual support arising. When we consider the eventity in its relation with other sub or supra eventities as part of a holarchy where the same eventity is seen either as a whole or part depending whether one is looking upward or downward in the holoarchy. Of course we define the holarchy as the intersection of what Goertzel calls the heirachcy and the heterarchy. Here the individual eventities have their own natural Chi and Li that gives them coherence beyond that which defines their kind. This special individualized coherence together with the holonic character of each eventity gives the minimal system of eventities the ability to give mutual support to each other. Finally at the level of holoïd we see the holographic nature of the eventity. Each



part carries a picture of the whole and what Boehm calls the implicate order appears. Here each eventuality interpenetrates with all the other eventualities in the minimal system. This is the positive face of the void. When we look at these levels of connection within the Thing we see the nature of the social clearly. The social is what allows us to form gestalts of natural complexes as kinds of eventualities essencing forth. We see this through our essence perception and hypothesize about it with our abduction. The social is has in inherent character of the emergent which defines both the advent of the new and the maintenance of the normal between advents of the genuinely novel. The social is experienced as a holoarchy which combines the heterarchy (lifecycle) and the hierarchy (functional kinds of work). Within the social each individual has its uniqueness which cannot be reduced to its kindness. Outside the field of the social this uniqueness of the individual cannot be recognized. Finally the social partakes in interpenetration. Each individual has an image of the whole (Mead's generalized other) within it. This appears as the possibility of spooky action at a distance through intentionality. It also shows how the social emanates from the void and is essentially embodying the void. This is because interpenetration is the positive face of the emptiness of the void.

Looking at the internal structure of the Thing we see that we recognize the aspects of the social in the different levels of its harmony. And we see that the ephemeron is implicit within that structure. Thus when Identity, Reality, and Truth become separated within the realm of Conceptual Being this has already been prepared within the inner structure of Primordial Being. Within the Thing there is a moment of the anti-social as the ephemeron. Within Conceptual Being there is a moment of the social as the weightings, tendencies, propensities that haunt the subjugated objective universe. These two phases of the Thing and the Objective world belong together and are in fact the Same. Our movement between the utopian image of society and the projection of the physical universe is the eternal return of the Same within the Western worldview. The fact that we have to deal with our self-alienation from the Thing as we confront the objectified universe as lonely subjects is implicit in the dialectical relation between our utopian ideals and our socially constructed reality that is in fact anti-social. The structural relations between these two phases underline the fact that they are two aspects of the same thing. Phenomenologically we see that the Thing gives us the basis of a social phenomenology which turns over the transcendental idealism of solipsistic phenomenology. Hermeneutically we see that the lost meaning within the objective universe is gathered together in the always already lost origin of the Thing -- the cosmic sacrifice of the big man as either Yamir, Prajnapati, or Purusa.

## 8.2. Aphorisms

An aphorism is a saying. For instance, Heraclitus has the saying:  
Nature likes to hide.<sup>1</sup>

When the isolated eventuality that appears is a speech act then a situation obtains which needs special consideration. We move from *physis* to *logos* which is a primal split in our apprehension of the emanation of things. The recognition that these two emanations are the Same and thus belong together has been lost in the Western Tradition. In China there was a single phenomenon of unfolding called *Chi* with an inner pattern called *Li* whether it arose within man as speech or outside man in nature. No split was made in the unfolding of speech and the unfolding of nature like the split devised by the Greeks. Our Western proclivity to dominate the unfolding of nature through the unfolding of speech did not occur to the Chinese as a possibility. This attempt to dominate the outward unfolding by the inward unfolding is called ideation. We produce ideas as a means of representing and controlling outward phenomena. And this is the root of all out dualisms: mind/body, etc. Derrida looks back on this history and sees that speech has superseded the more basic human *physis* of writing. We can see writing as our own *physis* which is obscured by the overlay of speech which produces illusory continuities by means of which ideas are projected on nature. But what is the *logos* of nature if writing is the human *physis*? The *logos* of nature is technology. That is nature turning back on itself to become self-controlling, self-guiding, self-moving, self-producing. Through technology nature speaks to itself via the mediation of man. Though writing man speaks to himself through the mediation of nature as pen and tablet. It is amazing that all of our culture is dependent on this mediation, this essential technology of writing but that the ephemeral speech is the master dominating and obscuring writing giving it a secondary role. Speech by itself produces an ephemeral culture which vanishes with the speakers. But through writing, if enough of a body of works survives we can consider ourselves inheritors of the culture of the Greeks. And where do we deposit what we write and what is its medium but nature itself. So when Heraclitus says, “Nature likes to hide” on meaning of this is that it hides in us. It hides in us as our *physis* beneath the *logos* as the substrate of ideation and the means of cultural transmission. But we also see that the “*Logos* likes to hide, as well.” It hides in nature as the speech of nature talking to itself in the form of self-steering, self-moving, and self-production. If *Physis* is the *Chi* of nature and *Logos* is the *Chi* of man, then the self-steering, self-

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1. *Analecta to the Pre-Socratic Philosophers* Kathleen Freeman (Harvard U.P. 1948) page 33; number 123

moving, and self-production of nature must reveal its Li whereas the writing of man which reveals his physus must reveal man's Li. Thus we can say that the Logos loves to hide within reified nature just as the Physus loves to hide within man as reified speech, cum cultural artifacts. What we call the logos of nature is its Li. What we call the physus of man is his Li. Li is the inner patterning or coherence revealed through the flow of the Chi. The Li is the Yang inscribed within the Yin. We read the inner nature of man in his cultural writings passed down through the ages. We read the inner culture of nature in its self-steering, self-movement, and self-production.

Timons gave a sketch of Heraclitus as follows:

Among them Heraclitus the mocker, the reviler of the mob, the riddler, rose up.<sup>1</sup>

The aphorism may be seen as a riddle, or a mocking speech that teases the hearer and demands explanation. It is an event within the Logos, a crystallization of speech that demands more speech in explication. But given the typology advanced above we can see the aphorism in four forms.

- a speech event, a riddle (logos in man)
- a writing event, an enigma (physus in man)
- a natural event, an mystery (physus in nature)
- an linguistic event, a conundrum (logos in nature)

We stand like Oedipus before the Sphinx. Oedipus was asked a riddle but written within him was the enigma of his birth that would tragically be revealed. Then too there was the mystery of the plague on the city of Thebes which manifested outwardly as a natural event. And then again there was the conundrum of the oracle of Apollo that had rejected him as unclean. In Oedipus we see each of these aspects of the puzzling nature of existence as different faces of the truth which likes to hide. Physus hiding in man, logos hiding in nature. So the interaction of physus and logos once split is not simple but very complex. The tragedy of Oedipus reveals the deep insight that the Greeks had into the tragedy that unfolds from the fatal splitting of the primordial upwelling that we have inherited. The unity before this split stands as an always already lost origin which we can never recover. It is covered over by a primal scene of incest which breaks fundamental taboos.

The aphorism is as it arises out of the Thing, as it gives us insight into the nature of

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1. Early Greek Philosophy Jonathan Barnes (Penguin 1987)

things, is not merely a sentence pulled out of the stream of speech. The aphorism is a crystallization of thought perhaps so dense that it can never be fully explicated. But it may also be seen as something inexplicable in nature, something inexplicable in the traces of men that shows us something of their inner nature, something inexplicable in saying of nature to itself. Like the DNA code by which dumb nature teaches itself the dance of life. The aphorism in this sense is ur-speech, a primal speech to which we must cock an ear and listen with a special attentiveness. We are most interested in the logos within nature, but cannot consider it in isolation from the other manifestations of physis and logos. We cannot consider it without contrasting it to our writing obscured by speech. That writing elsewhere<sup>1</sup> has been identified with software. The DNA in nature is software. The software we create for computers has the same nature that Derrida finds in writing that underlies ideation he calls *différance*. It appears as a new kind of entity existing at the third meta-level of Being. Note the similarity of software with DNA by which organisms guide their self-production. Thus there is an inner connection between the physis within man and the logos within nature.

The key point about aphorisms is that they are singular phenomena. They exist as isolated individuals which lack a framework that makes explanation possible. We bring them under a single purview but cannot fully explicate them. We are reduced to noting their occurrence and venturing tentative explanations and speculations. But in the end they stand like relics from archeological expeditions mixing speech and silence.

### 8.3. Axioms

Aphorisms taken together may form a set of axioms that work together to create an effect. But this effect is projected upon the aphoristic axioms which stand mutely containing undefined terms like the geometrical point. When we consider the aphorisms themselves, like those of Euclid, then we see them as isolated individuals which appear out of the void to stand near each other without touching. In the axioms of Euclid the four types of puzzle abut each other. The Axioms are sentences from speech and thus are part of the logos. But in order to make something of them one must engage in proof which is a unique kind of algorithmic process which is like software of the mind. It is meant to connect things to the axioms by a series of steps. In Euclid's geometry the steps concern the writing of lines upon the dust as is done by Meno's slave at the bidding of Socrates. Thus the sayings speak about writing and allow traced constructions to appear flowing from the axioms. But there is a relation

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1. Software Engineering Foundations: Software Ontology (manuscript)

between these traces in the dirt and physical phenomena. We see planets traveling in ellipses. We construct the ellipses in traces in the dirt based on our axioms and then look at the sky and see, by the time of Kepler, that the planets are tracing the same figures, which by the time of Newton we realize that they are falling around these ellipses. Prior to this alignment between our traces and the phenomena we assumed that the planets must be moving in circles and made elaborate constructions to show how the circles within circles had to be constructed to imitate elliptical motions. But finally when we align our mathematical geometrical constructions with our observations of the world we get some insight into the logos within nature, that is the inner reason behind myriad phenomena like Newton's law of gravity that connects what happens in the celestial realm with what is happening in the terrestrial realm. This confrontation between the different aspects of the aphorism within the axiomatic system gives us further insight into the set of axioms. We can only understand the axioms by looking at how they unfold into the formal system and how that formal system gives us a means of understanding nature. However, formal systems can only take us so far and eventually we must resort to structural systems to give us a better grasp of phenomena. The structural system digs even deeper into the nature of the aphorism. In the structural system the closure of the formal system is given up for greater explanatory power. The explanation of chemical reactions on the basis of the theory of atoms is a good example of a structural system. Here we have elements. We do not ask why these hundred or so elements with exactly these properties. They are the givens, the independent isolated units that we explain structurally by the theory of the structure of the atom. The atom is a matrix within which all possible atoms can be constituted and the transformations and interactions between atoms can be understood. The atom is an aphorism of pure physis. Why these elements in this order with these interactions and transformations. This is the riddle of the atom that is seldom asked. But our theory of the atom's structure is a linguistic conceptual construct. That is pure logos. We seek to align our theory of the atom with the behavior and existence of phenomenal atoms. And our theory of the atom very successfully does that as is proven by many successful chemical results. This alignment of logos and physis is the goal of physics. But we see that our scientific culture that explores the ramifications of this theory and the fine points of chemical reactions is dependent on writing of scientific articles. And those articles are not just dependent on theory but essentially dependent on experimentation. Experimentation links the theory with the phenomena. In experimentation the link between the phenomena and the theory of the phenomena is forged. What is experimentation but a writing on nature which when read back gives us an intimation of the logos within nature. Thus in science the physis within man is directly linked to the logos within

nature. This link allows our theory of the atom to become aligned to finer and finer degrees with the phenomena of atoms. Experimentation is the nexus of embodiment within science. Through it theories become embodied but this occurs when the physus in man is directly linked to the logos in nature. Experiments are a way for man to listen to the logos in nature by writing into nature and seeing the results when that writing is read back as observations. The link between the physus in man and the logos in nature allows the alignment between pure logos and pure physus. Embodiment occurs at the crossover point. Thus we must look in embodiment for the intersection between the logos in nature and the physus in man.

#### **8.4. Requirements**

In Systems Engineering everything revolves around requirements. Requirements are themselves individual isolated statements of needs or demands, in short, of desires. The best requirements are orthogonal to each other and as a set they should form a locus like a set of axioms from which the system is derived as an answer. Requirements Analysis is the basic kind of work which deals with requirements attempting to make them as clear and distinct as possible following the dictums of Descartes. Requirements are analyzed and separated from each other then logged in a database to form the basis of all other kinds of systems engineering work. The major problem of building systems is the changes to systems requirements during development. These changes have disastrous consequences but are all but impossible to avoid since most customers do not know what they want or need until they see it.

Requirements express desires. Systems Engineering builds machines that fulfill desires. Thus we might say that the object of Systems Engineering is to construct desiring machines -- that is machines embedded in desires and that have desire embedded into them. Those desires must form a nexus like an axiomatic set where the logos and physus may come into harmony. They come into harmony through the logos within the physus and the physus in man connecting to produce an embodiment. In this case the logos is the system design and the physus are all the properties of physical things that must be taken into account by the design. The physus in man is the writing of the design and the construction of the system prototypes. These are experiments which use trial and error and ad hoc means to approach a solution that simultaneously satisfies many competing constraints on the system. The logos within the physus is the set of possible satisfactory designs which will result in a working system. Between the set of possible satisfactory designs that simultaneously satisfy all constraints and the set of designs and

embodiments which may not satisfy all the constraints that are produced is where the actual embodied system comes into existence as an actual embodiment of the desired system that works. The production of contact between the logos in nature and the physis in man is an exercise in constructivism. No ideal method can guarantee success. Only trial and error and ad hoc methods can finally produce a satisfactory solution. As Feyerabend says for science so the dictum holds for systems engineering “Anything Goes.” The floundering around for workable solutions is only matched in intensity by the various attempts to actually distill the actual requirements for the system being built. To the extent that the requirements adequately express real desires and to the extent that these desires can be satisfied by an actual system, to this extent the work of systems engineering can be successful. That requires the vision of a systems architect whose role is described well by Eberhardt Rectin through a series of aphorisms. But beyond that vision it requires the different kinds of work that make up Systems Engineering to be applied together in a non-routine way with insight and perseverance. Every experiment that occurs in science presents a systems engineering problem. This only becomes clear as the experiments and the apparatuses become more complex but is true in even the simplest experimental situations. When Bacon takes his chickens out into the cold he does not consider the effects of the experiment on the observer and so dies of pneumonia. The experiment embodies a series of desires set up by the theory as a hypothesis. The experiment must adequately satisfy all these desires and produce a clear cut result. The experimental design must create a situation and an apparatus that satisfies these requirements. Many times this requires a great deal of constructivist work and ad hoc trial and error techniques to be tried before a satisfactory experimental solution is found which can lead to clear cut positive or negative results. As Popper has said everything in science that is not testable is really just philosophy. The rigor of producing testable theories which give good hypotheses and can lead to fruitful experiments is a high art. But within that art is another art in designing the experiment which is basically a systems engineering task. Systems Engineering is an intrinsic and crucial part of science that is usually forgotten because all scientific articles are written backward. They do not tell how solutions are arrived at but tell the solutions as if they appeared out of nowhere so the clever systems engineering that allowed those results to be obtained is hidden. This is the reason that science is open to fake results. I can claim any result if I do not have to be specific about how I got that result. Built into science there is a blindness to systems engineering. Each experimenter must start from scratch in order to try to reproduce results and essentially do the systems engineering of the experiment over again. If multiple differently designed experimental apparatuses

come to the same result the result ceases to be contested. In that work of verification by multiple experiments is a great deal of systems engineering work which produces unique solutions to the same problem over and over again. This systems engineering work is where science actually comes into contact with its object. The goal is to produce an experimental apparatus that will show a particular phenomena in a specific light. The apparatus is not an end in itself as it is in many systems. The apparatus is a means to reading the logos of nature, its Li or inner patterning. This is done by finding a way to manipulate the physus in man, his ability to write on nature so that the result may be read by him as an observer of the experiment. Here the logos in nature and the physus in man are much more starkly portrayed but the same juxtaposition occurs in any systems engineering project even where the system is an end in itself as a satisfaction of desires. This is because any physically manifest system is in some sense an experiment whose outcome is uncertain. That is why testing is an important part of systems engineering discipline.

#### **8.5. The Metaphor of the Birds and the Fish**

In this stage we have explored the first methodological distinction which has no order and no distance. Such distinctions are like the distinction between male and female. It is a pure distinction like on or off that only has meaning in relation to a network of other distinctions. At this stage we saw that what appears within the web of unordered non-distanced distinctions is a minimal system of independent isolated eventities. The eventities are Firsts. Opposite these appears the Catalyst viewpoint which is a Fourth. The Second and Third Peircian-Fullerian categories do not seem to apply at this stage. The Catalyst viewpoint may take on the coloring of any of the methodological viewpoints. We normally think of it in terms of the intentional morphe of Husserl's phenomenology projecting on the hyle of the eventities. However we can take another view which attempts to withhold this projection. That other view sees the eventities of as things in their essentially social setting instead of as reified objects. Here we see that counter to the empty nihilistic world of the objective physical universe there is an intensely social world within which things are submerged in the process of social constitution. Here Primordial Being dominates over Conceptual Being. And we have shown the reversability of these two ways of looking at things/objects where the Primordial Being of the Thing contains the anti-social strife ridden ephemeron whereas the objective universe contains the hauntings of tendency that still weakly point back to the social in spite of all the attempts of science to expunge it.



Even when we consider the eventities within the objective universe alone rather than things we see that they are a mixture of logos and physis. We see this in the nature of aphorisms, axioms and requirements. This mixture of logos and physis again points to the social basis of our phenomenology because the science that explores nature arises from beings that are part of nature. It appears as a shared belief system forged intersubjectively as a historical project. This project must work with all the different shadings and combinations of physis and logos and depends upon embodiments to make the connection between these two reified aspects of the upwelling Chi that makes manifest the inner coherence of things called the Li. Little did our progenitors realize that by splitting physis and Logos and producing dualisms would that necessitate the extreme efforts needed to bring these two back together again. That bringing back together produces the realm of embodiments. And it is embodiments that we are studying so assiduously. If we cannot see the embodiments as things within the social context of the Thing where the different levels of harmony are realized. If instead we must view the whole universe through the lens of the strife of the ephemeron then we still see that the production of embodiments is a social project which connects these embodiments to desires as requirements. We see that the embodiments may be part of the praxis of science or just pure expressions of need. The requirements are based on desires which are tendencies, propensities, or weightings born of the schizo substrata that permeates and huants the objective universe in spite of all attempts to suppress it. This schizophrenic substrata is all that is left of the multi-layered harmony of the world based on the Thing which expresses Primordial Being instead of Conceptual Being. Deleuze and Guattari speak of the layers of the Oedipus complex. But for Oedipus we read Ideation. The layers are the savage inscription on the social self, the barbaric tyrant, and capitalism. The writing which is the human physis is expressed socially by the tatooning and torture in initiation of the members by other members. The tatoos become an expression of belonging and thus take on a linguistic function. In the stage of the barbarian tyrant one self comes to overwhelm all other selves and the generalized other of the social group is embodied in the tyrant. The tyrant for the Greeks is one for whom everyone in the state is treated as part of the tyrant's household, that is part of his person. In capitalism this function of control escapes from the grasp of one man so that the social group becomes dominated and tyrannized by the systems that it has set up such as production and exchange of commodities. But all of these layers merely express the levels of the reification of Ideation. From the no-trace of the unadorned humans arises the savages that inscribe themselves with traces of their social group. Within this social group arises signs of functions of the social group itself the most

insidious of whom is the tyrant who attempts to be a sign of the whole. And then finally the functions break free of embodiment within the group and become free ranging and out of control forms that express functions. Ideation is Form plus sign plus trace plus no-trace. What Deleuze and Guattari fail to describe is the pre-savage wild human society that does not tyrannize itself and inscribe itself. These were the people of the waters edge described by Morgan.<sup>1</sup> The people of the lost epoch of human evolution. The people who went back into the sea and returned. This long lost experience before hunter gathers gives us at the root of our worldview an essential relation to the sea. And the sea cannot be inscribed. Homer calls it the “unplowed sea.” It is from there we get the essential metaphor for Chi of FLOW. It is this which lies beyond the physus/logos dichotomy. And the standing waves or tides form a pattern that expresses Li.

The eventities are like the birds above the sea or the fish below the surface that move in flocks and schools. When the birds look down they see their shadows and then other shadows below the water. When the fish look up the surface is like a mirror in which they see their distorted image and beyond the mirror the dark shapes of the fish. Among the fish are the dolphins who are the long lost friends of man. Men who lived on the edge of the sea might have ridden the dolphins out to where only the fish and birds were visible. But the essential relation between fish and birds in relation to the surface of the sea is what lies beyond social inscription. Sometimes the flying fish break the surface of the water or the birds dive for a meal. But for the most part there is the strange mirroring in which each sees themselves against the shadow of the other. When Heidegger speaks of the mirroring of the fourfold this is the kind of relation he is attempting to describe. Here the fish see their own reflection along with the shadows of the birds that exist in a different medium. So to the birds see their own reflection along with the shadows of the fish. They are independent but the shadows and reflections mingle for each differently in their separate realms. This is an essential model of interpenetration because each thing is essentially in its own medium and the reflection of that thing and the images of all the other things from its point of view mingle together in each thing. So we can say that a realm of Primordial Being lies before the series of destructive phases of the unfolding of ideation in the guise of the Oedipal complex. Those stages demonstrate the construction of Conceptual Being is a social project with vast ramifications. We sketch the source of this as the idyllic era when men returned to the sea. But we can see that as well in the ideal of the moieties of all men and all

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1. The Decent of Woman

women posited by???? in???? which Deleuze and Guattari call a strange book. There is a social model for the birds and the fish where men and women inhabited separate social groups that operated on an exchange basis like moieties. In that ideal world the men would see their reflection in the moiety of women mingled with the shadows of women. So to women would see their reflection in the moiety of men mingled with the shadows of men. This impossible social situation, the only solution to certain anthropological dilemmas, is reflected mythologically in the stories of Centaurs and Amazons. These two speculative examples of a mirroring like the mirroring that Heidegger describes in the round dance of the fourfold show us primal scenes of intrinsic harmony of the Thing. It is a more fundamental and primary primal scene than that of inscription expressed either as the pen and the tablet in semitic sources or the well and the tree in Indo-european sources. In this more basic primal scene the essential difference between the pen and tablet or the well and the tree vanishes. Instead of objects we have flocks or schools of birds or fish which experience essentially the same phenomena of mirroring and shadows. Here we see a mingling of the positive fourfold as mirroring and the negative fourfold as the shadow of the Other. The whole of this more basic primal scene calls attention to the surface of the water. When it is calm and not pierced it reflects more perfectly. It is the very image of the source of primal causation beyond mirroring and reversibility -- that is pure yang beyond the yin in yang of secondary causes. If the Chi is the swimming of the fish and the flying of the birds in swarms that is an expression of pure yin. If the Li is the patterns of the changing configurations of the flock or school in flight. Then the occasional flying fish or diving bird will appear as a secondary cause for the changing of the pattern as it dodge the intruder from the other realm. But the difference between realms is fundamental and so the surface of the sea appears as the great unifying cause that makes fish *fish* and birds *birds*. This pure difference between realms is invisible for both yet it is the means of seeing and partially interacting for both with the other. The pure yang is invisible because it sets up the mirroring between different yin realms. The eventities as separate individual and isolatable things appear in these realms. The excursions of secondary causes across the boundaries from one realm to the other appear like the Catalyst viewpoints which are pure Fourths thrust into the sea of Firsts. So our attention is focused on Firsts and Fourths or upon the pure yin or the yin in the yang. Attention is taken from the yang in the yin called Li or the pure Yang of the primary causation. The yang in the yin is suppressed because it point s back to the idyllic world of the Thing with its Primordial Being that fills an world made sterile by objectification. The pure yang is suppressed because it unifies all phenomena as interpenetrating. It is significant that the highest level of

harmony expressed in the Primordial Being of the Thing is interpenetration as fullness of the holoïd. Pure Yang may be seen in the reflection of interpenetration as emptiness. The social at its highest point of harmony plunges out into that emptiness marked by the surface of the sea.

The objective world in which at the level of no order and no distance contains only Firsts and Fourths and thus only pure yin and yin in yang fits like a glove to its opposite that contains the social reality of the yang in yin of the Thing and the pure yang of the primary cause. The only other question that might be asked is where does the light that lights this reflection that unites positive and negative fourfolds come from. It is truly a divine light.

## 9. Stage Two

Speaking about stage one was difficult because lack of order and distance constricts our view of any system to such a degree that only the individual isolated elements are left and perhaps the viewpoints on those elements. It is interesting that these are exactly what appear in Husserl's phenomenology as the intentional *morphe* and the *hyle* which interact to produce *noesis* and *noema*. So as we graduate to the second stage we will be exploring the realm in which *noesis* and *noema* are produced. Of course we are interested in a much wider application of these differentiations of consciousness into the perception and the perceived, but Husserl's phenomenology gives us a touchstone from which to take our bearings. Now we enter the realm of the methodological distinction which gives us partial ordering. A power set gives us all the possible ordering of a set of elements. The power set forms a lattice that stretches from the null element to the full set of all the elements. A power set is a full ordering. A partial ordering is some subset of a power set. When we speak of transformations a partial ordering gives us one way transformations that may not necessarily be reversible. Thus variables that are partially ordered may not have ways to get from one value to another in a smooth via smooth route. There will be discontinuities between values. A partial ordering is portrayed best by overlapping circles of Venn diagrams. With partial ordering the isolated independent elements come into contact for the first time. We do not know their linear order or their distance from each other. All we know is that some elements are grouped and some are not. The operations that transform the groups may not be reversible. Thus just because something is grouped before an operation does not mean it is grouped after the operation or that you can get back to the prior grouping. Partial order is minimal ordering. It is one notch above no ordering, just having distinctions. It is

an ordering with the minimal assumptions as to how you can manipulate the ordered elements.

When we move to the stage where the minimal ordering we call partial ordering appears in which our systems are arbitrary groupings of components, no longer totally isolated but still independent and only loosely controllable by their ordering, then we notice that our primordial Catalytic viewpoint is transformed. It splits into two other viewpoints called Agent and Function. The agent viewpoint sees the autonomy of the components. The function viewpoint sees the intentionality of the components. The agent viewpoint sees the independence of the components within their groupings. The functional viewpoint sees the differences of the components from each other in their groupings. Notice how important it is that there is a grouping as a basis for seeing independence or difference. By seeing independence in relation to the group of a component the agent viewpoint sees the individual components as autonomous. By seeing difference in relation to the group of a component the functional viewpoint sees individual components as having an intentional use in relation to the rest of the group. This bifurcation of the primordial viewpoint is a very important phenomena. It is based on the arising of the Fourths of the agent and functional viewpoints on the partially ordered Firsts that it is first possible to see Seconds and Thirds. The agent and functional viewpoints are a co-dependent arising like the co-dependent arising of the hyle and morphe. Here there is a specific qualitatively different light shed on the same Firsts from each of the mutually dependent arising viewpoints. Agency is more closely related to noemata and Function is more closely related to noesis. This is because the agency viewpoint sees the Firsts as independent of consciousness whereas the function viewpoint sees them as more dependent on consciousness. Thus within both of these viewpoints the hyle is fused with the morphe but with different emphasis on independence or functional dependence. In either case within the partial ordering is set up relations (Seconds) and significances (Thirds) of relations. In the case of agency the relations are between independent entities which are in effect external and projected. In the case of function the relations are between mutually dependent entities which are in effect internal and discovered. In the case of agency the significances are by definition as they arise out of communication. In the case of function the significances are diacritical.

It is of interest that we have one methodological distinction (partial order) that produces two different viewpoints (agent and function). With the arising of those viewpoints the nature of the First and the Fourth are themselves changed. The First

is no longer independent isolated elements but independent grouped elements. The Fourth is not just a Catalyst but actually acts on the Firsts via the projection of agency or the discovery of function in their groupings. And here we see for the first time autopoiesis arising as a significant matter for our thought. The dominant paradigm of our science is functional seeing how parts have different uses within wholes. Autopoiesis as a paradigm calls attention to the individuals and draws attention away from the species. It emphasizes the importance of autonomy to life instead of the function of the individual within the evolutionary process. Thus we can see that autopoiesis in its emphasis on autonomy is a counter balance to the dominant functional paradigm and thus seems to us new and exciting from an intellectual viewpoint. But it is only because function has been over emphasized by science in the past that we can feel this excitement because these two viewpoints or grouped components arise together and must mutually define each other. Functionality cannot exist without autonomy and vice versa. Autonomy was always assumed in all evolutionary theories and ignored as an uninteresting given. The theory of Varela and Maturana has merely shown that was taken for granted by evolutionary theories, the locus of life in the autonomous individual organism, has some interesting theoretical properties worth dwelling upon. Functional theories that start with holes and see individuals as parts need the individuals for the whole to exist regardless of their functions. Theories of autonomy start with the whole of the individual “unity” as given and see that individual as “closed,” which is to say without function within the whole. But as the definition of the whole has shifted so functionality plays another role. Now functionality is the inter-operation of the elements of the autopoietic network within the autopoietic unity. They work together to produce the organization of the autonomous individual and thus each element of the network has its function within that new whole. The emphasis on which is more basic has changed but each viewpoint makes use of the other as its complementary opposite within its own theoretical context. And this is exactly the kind of trade-off that exists between noesis and noema in Husserl’s phenomenology. Noesis and noema occur together in every cognition it is merely a matter of emphasis which is seen as dominant in a particular cognition. Function and Agency viewpoints arise from the bifurcation of the Catalyst viewpoint. They arise together as complementary opposites which cannot exist in total independence from the other. This is a fundamental transformation in the characteristics of viewpoints. The Catalyst viewpoint did not need anything other than itself as a means of relating to the independent isolated eventities. The Agent and Function viewpoints see those same eventities through the veil of groupings and which ever viewpoint you take on the eventity implies the other viewpoint as a possibility. The

question is whether the whole is the eventity itself or something bigger than the eventity such as the group of eventities. If it is something bigger than an individual eventity then you must apply the functional viewpoint and hold autonomy as implicit. If it is the eventity itself that is the whole then you must apply the agent viewpoint and hold functionality as implicit. The Firsts are transformed from things without qualities to forms that have qualities. Those qualities are either internal to them (as a network of functional nodes) or external to them (as the role they play in some greater whole). Through groupings, sets with similar distinctions, eventities are seen as autonomous or as functional and the viewpoints are generated out of the bifurcation Catalyst viewpoint that which project dependent arising on the eventities themselves. This is to say we do not just see ourselves as projecting all of this but also discovering the autonomy and intentions of the eventities.

When we say that Seconds and Thirds are generated at this second stage in the arising of methodological distinctions within our systems theory we need to be more precise. We can say that when we had no order there were many distinctions that arose which were not coordinated to imply any order. But when groupings of eventities become possible then we can begin to compare one eventity to another in terms of its characteristics. In this comparison of characteristics we can either take the agency or functional viewpoint. If we take the functional viewpoint the most important distinction will be between the characteristics of inputs and the characteristics of outputs of individual eventities. If we take an agent viewpoint the most important distinction will be between the autonomous self and the other. Thus all distinctions may be distinguished between those that on the one hand relate to inputs and outputs and on the other hand relate to self and other. Notice in one case we focus on the relation between sets of eventities through their inputs and outputs. In the other case we focus on the relation between a single eventity and all others. Thus the viewpoints give us a meta-criteria for grouping characteristics that cause us to focus above the eventity level looking for wholeness in sets of eventities or cause us to focus at the eventity level looking for wholeness there and differentiation between that eventity and all others. These meta-criteria produce significances. Those significances are expressed as hierarchies of either agency or functionality. You will notice that one gets more information from a hierarchy than is possible to get from just a set of distinctions listed. A hierarchy is an organization which displays significances. Thus even if we use the meta-criteria to organize the eventities characteristics and figure out relations between them it is by organizing these eventities into hierarchies that we make visible the significant

features of our organization. So Seconds and Thirds arise at this stage and they allow us to identify relations and organize those relations into hierarchies that display significances. Those relations may be between agents or between functions. Those hierarchies may be functional or nests of autonomous agents. And ultimately we are interested in both kinds of relation and significance simultaneously although we can only see one set at a time.

Each of the function and agent viewpoints support a hierarchy. A hierarchy is a kind of partial ordering. So we can see a set of eventities as simultaneously grouped from the functional and agent viewpoints. Normally we see it as grouped by one on the background of the other. We can see our eventities as a hierarchy of agents on the background of groupings of those agents in terms of functionality or we can see our eventities as a hierarchy of functions on the background of groupings of those functions in terms of agency. In systems we build these two viewpoints are equally important and coming to the right set of groupings in a design is an important goal of any system design.

Now we will extend our discussion by pointing to a connection that is seldom made but is very important. This is the connection between Agency and Algebra and between Functionality and Logic. The minimal logic has truths, operators (*and/or/not*), and dualities. The minimal algebra has numbers, operators (*existence/all/plus {other operations are implied in plus}*), and dualities. The dualities arise out of the application of reversing operations or multiple operations that cause an reversal. The point is that we can see logic as a truth function applied to functionality. We can see algebra as an existence function applied to autonomous individuals. We must have autonomous individuals to count. We must have characteristics predicated in order to assign truth values. Predicated characteristics of individuals in sets are functions. So our two most basic ways of manipulating things (algebra and logic) arise at this second stage where we see individual autonomous eventities to count or we see functional relations that arch over and include things into sets or not. The interesting thing here is the connection between algebra and existence operators such as *all* and *there exists*. These terms must be added to logic in order to talk about individuals. But they are implied within algebra because when you count something you assume that what is counted exists. When you wave your hand over a set and say *all* these then you assume that those things so grouped implicitly exist together. And this existence and truth are fundamentally related to each other. Existence is related to reality. Truth, reality and identity are the three basic meanings of Being in the Greek. And sure enough when we produce a formal



system we make use of identity as equality to make that system complete and interconnected. Both algebra and logic use identity which is basically a duality which is tautological. Tautological dualities are the basis of every formal system. But this brings up the relation of Function to Truth and Agency to Reality. We see clearly that when we assign functionality to something there is a question whether that thing truly corresponds to that function. When we assign autonomy to something there is the question whether that thing is really autonomous. Thus when we declare existence or truth we are talking about the verification that the autonomous thing really exists or the functional thing truly has that functionality.

Now what is interesting about all this is its connection to Godel's proof. When Godel proved that formal systems cannot be axiomized it was really a combination of algebra and logic which was proved ungroundable. A simple algebraic system by itself or a simple logical system is groundable. But it is the combination of the two which cannot be axiomized. Now we know that axioms are a form of First seen at stage one. So the indeterminateness that opens up for any formal system of a certain complexity actually prevents us from connecting stage two formal systems back to stage one axioms. Because between functionality connected to the world via logic and autonomy connected to the world via algebra there opens up a realm of indeterminacy. That indeterminacy has called a halt to Hilbert's project of axiomization of every formal system. But it also tells us that stage two is an emergent level that is non-reducible to stage one. And this is an important realization. You cannot look at the world through the agent and functional viewpoints and then determine the truth of functional assignments and the reality of existence claims for agents and then ground those back in the axioms that exist at the level of stage one in which there is no order and no distance. When partial order arises as groupings of independent isolated eventities and when the Catalytic viewpoint bifurcates then a set of relations and significances appear that cannot be put back into the bottle, the genie has escaped and set up formal relations that cannot be reduced back to the axioms on which they initially depend. Our formal systems have side-effects that are not predictable from the axioms and cannot be reduced back to the axioms. Once this is seen then the importance of discriminating the stages of the unfolding of methodological distinctions becomes clear. Basically all the possibilities of formal systems relating to numbers or logical truths arise at this level. And also the Pandora's box opened by Godel's proof arises as the proof of the emergence of this systems level.

## 10. Stage Three

An interesting thing occurs at the next stage of the unfolding of methodological distinctions. Whereas at the last stage the Catalyst viewpoint bifurcated into Functional and Agent viewpoints while there was only one kind of ordering, partial order, which was seen from those two co-dependent viewpoints; now the opposite is going to occur. At this next stage there are two different methodological distinctions that arise from the bifurcation of partial ordering that exist in relation to the formal system. At this stage the linear order without distance appears as opposite to partial order with distance. Neither of these kinds of order are quite the full order of the real number line. Each is missing something crucial. Partial order with distance is missing reversible operations that would give it linearity. Linearity is missing distance that would tell it how far apart the linearly related elements are. Thus from the point of view of stage four of the set of methodological distinctions this stage is a defective intermediary between full ordering and minimal ordering. However, in this study we will find that this level is of great interest and in fact in many ways the other stages only exist to frame this stage. We will discover this stage to be inherently structural as we discovered the previous stage to be inherently formal.

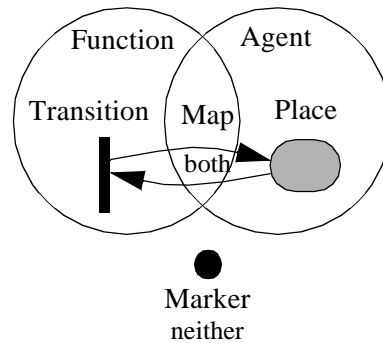
One way to approach this level is to realize that the distinctions between input/output and self/other that were produced as meta-criteria at the previous level can be permuted at this level. This in effect means that we can get a view of the two viewpoints that were separate at the last level as acting together at this level. There are basically two ways to interrelate the two viewpoints. We can array their meta-criteria against each other producing an  $N^2$  table or we can show their interembedding within each other to produce the  $2^N$  combinations.

*Table 21: State Machine*

	Self	Other
Input	prior state	Event
Output	post state	Action

If we produce all the possible external relations between the meta-criteria of function and agent viewpoints we generate the basic elements of the state machine. On the other hand if we produce all possible interembeddings we get the essential elements of the petri net. The petri net and state machines are duals of each other.

Figure 32: Petri Net



Now this is strange that when we permuted the meta-distinctions associated with the viewpoints or we embed the viewpoints we get two different but dual computational structures. Each of these computational structures exist as either a set of rules in the case of the colored petri net or as a set of vectors as in the case of the state machine. These rules or vectors are sets of statements that together produce a continuing computational action. They are different from the axioms which operate together as a static basis for the formal system. Here the statements say what happens to output places when a marker of a certain color appears in an input place. Or they say how the prior and post states of the state machine is related to events and actions. In either cases they exist as a set of production rules that define behavior. These sets of production rules combined with the formalisms of the state machine or the petri net define a minimal level of algorithmic action or computational behavior. But these are not turing machines. The state machine must be evolved through push down automata and to finally arrive at turing machine status when it is given a tape instead of a stack to operate upon. These are of course related to Chomsky's levels of language. Each development of the state machine that is necessary to turn it into a turing machine defines it as an acceptor or producer of a language. We will argue that the turing machine is equivalent conceptually to the full ordering at stage four. So the Chomsky hierarchy of languages and the hierarchy of automata that are developed from the state machine (and implicitly by its colored petri net dual) are our road from stage three to stage four which means from partial computation to full computation.

But before we can walk this road it is necessary to look at how our Peircian-Fullerian categories are transformed at this stage where we have two methodological distinctions as a means of looking at the combination of the functional and agency viewpoints in the guise of computational structures. At this

level arises the structural system as an extension of the formal system. Through that yet another emergent level of methodological distinction is defined. Formal systems allow proofs and are given strength by their closure. Structural systems are not closed but have a great deal of explanatory power that Formal systems lack because the structural system can cope with time and discontinuities across which forms transform. Those transformations can be seen as sets of production rules that describe the rearrangements of content and changes of forms. Those transformations may be computed based on state machines and colored petri nets depending on whether the functional or agent viewpoints are dominant. The functional viewpoint prefers the state machine with its dominance of input and output. The agent viewpoint prefers the petri net with its emphasis on place and the existence of markers. But either one will do for constructing the minimal working model of structural transformations.

In fact we can look to the kinds of minimal methods that appear between the functional and agent viewpoints. Methods are bridges between viewpoints. They will become very important to our discussion as things progress and we attempt to derive the complete set of minimal methods. But here we can look just at the two minimal methods that relate the function and agent viewpoints. Those minimal methods are mapping and virtual layered machine. The mapping in this case is the mapping between the functions and agents within a system. Such a mapping is static synchronically but considered diachronically it changes over time as design of the system progresses. The virtual layered machine is a set of instructions that work together to solve a problem. Such a machine is composed of functions and may have an associated state machine or petri net to determine the sequence of applying the instructions of the machine. Or the instructions may just be a set of tools offered to some outside entity to accomplish some task. The virtual layered machine is a combination of functionality within an agent. The mapping is an external look at the ideal relation between functions and agents. These two minimal methods serve as bridges between the functional and agent viewpoints on a system. But in them we can see a simple model of the structural system in which functional changes are produced in time by the execution of the virtual layered machine. These instructions that effect functional changes may be controlled by state machines or petri nets or not. But in effect by producing the embodiment of function within each agent they allow the mapping from all agents to all functions to be produced. We can see the virtual layered machine as the set of operations necessary to solve a problem that is a prerequisite for a genetic algorithm. As such the agents may change their functional structure over time through crossover and

mutation becoming better or worse by some fitness measure. In that case the mapping between function and agency is continually changing in a diachronic view. In normal systems we try to keep the mapping as static as possible except for degraded modes of operation. But the case of the genetic algorithm shows that there can be systems where the diachronic change in the mapping from agent to function must necessarily change.

The minimal methods only arise at stage three. In fact, an interesting point is that the minimal methods all model themselves on the two dual methodological distinctions. Thus mapping is like partial order with distance and virtual layered machine is like linearity without distance. We can see this if we realize that the mapping between agent and function hierarchies uses one hierarchy against the other and that the hierarchies are a form of partial order but distance is introduced when you count boundary crossings in the other hierarchy. The virtual layered machines are essentially like structure charts and in them you know the order of execution of modules but not the distance between them. You do not care what the distance between them is but only the pure sequence of execution. So we see that minimal methods that relate two viewpoints are duals of each other and that those duals have the same mutual structure as the dual methodological distinctions that arise at stage three. We see also that when the minimal methods arise the means of embodying the functionality within the agents arises at the same time as the means of verifying that there is a mapping between the functional hierarchy and the agent hierarchy. At that precise moment our ability to model the structural system arises and we introduce time as computation in which agents perform partial functions which add together to solve some larger problem. This is not yet universal computation but is a reduced form of computation that allows the structural system to be modeled using minimal computational minimal methods. The computational minimal methods (state machine and petri net) guide the operation of the minimal virtual layered machine. This allows all the partial functions to solve a larger grained problem and appear whole.

## 11. Stage Four

The final stage of the unfolding of methodological distinctions is where full order is achieved. Full order is best represented by the real number line where you know linear sequence as well as distance between any two points at the expense of introducing infinities between each point on the line. At this stage we will show that full ordering is equivalent to the turing machine. The infinities between each

point on the number line is equal to the infinity of the right side of the turing machine tape. Also we will show that two more viewpoints arise at this stage bringing as a further splitting of the Catalyst viewpoint. This now produces a minimal system of viewpoints out of the primordial viewpoint. Through this arising of the minimal system of viewpoints ten more minimal methods are generated. The new viewpoints are reifications of spacetime into event and data by the imposition of a computational perspective. The arising of the two new viewpoints and their associated minimal methods actually send us back to attempt to understand the set of minimal methods more fully. The minimal methods are partial realizations of the turing machine within spacetime. This is a key point that we will spend a great deal of time and energy attempting to prove before going on to higher stages beyond the real number line and the turing machine. Because it is this level that is equivalent to any robust general systems theory like that of George Klir. All general system theories assume real number lines as a way of keeping track of dynamics and turing machine computation as a way of modeling those dynamics. Before we can go on to more specialized types of systems like the dissipative, autopoietic, and reflexive it is necessary to fully explore the level of general systems theory in order to provide a sound basis for further specialization. And we bring to this redefinition of the level of general systems theory an understanding of its computational basis as we explore the relation between the minimal methods and embodiment.

We could only really bring up embodiment when we reached this level because this is the level where the ideal autonomous and functional structural systems actually become embodied in spacetime. Spacetime is viewed as a fully ordered container. Johansson did not mention this. But it is the full ordering of the container that is its crucial attribute. And also this is the point where we first encounter spacetime which for Johansson was the primary and only independent ontological category. From a computational perspective we see this ontological category as events in time and data as the computational equivalent of space. These are two new viewpoints arising out of the Catalyst viewpoint. First it bifurcated into agent and function now it has bifurcated again into four viewpoints which is the same as the interembedding of the first two into spacetime. That interembedding is the realization of embodiment. It is that embodiment we shall explore here. Now we will see that the four viewpoints may be permuted and interembedded with each other to give new meaning to the synergy of the Fourth. If we permute the four viewpoints we get sixteen minimal methods. The twelve transitional minimal methods and four viewpoint specific minimal methods. If we interembed the four viewpoints we get

all the possible combinations of those viewpoints. In both cases there are sixteen possibilities. But with interembedding the lattice of possibilities ranges from all to none of the viewpoints with all the possible combinations between. This combination of all the four viewpoints into a single mega-viewpoint gives new meaning to the Catalyst viewpoint which from which all of them sprung. It is the mega-viewpoint that sees all spacetime. It is a Fourth, a synergy which combines all the viewpoints and all of their different possible combinations. And as a viewpoint on spacetime it sees positions in spacetime. These positions are the Firsts that appear at this next stage. It turns out that in order to be still in spacetime you must be moving. The minimal movement is a  $4\pi$  rotation which is called a spinor. The mega-viewpoints sees these still points that move within spacetime. Here at this stage relations and significances are again suppressed as they were at stage one. This is because in order to see significances and relations you must have a single viewpoint. Seeing different viewpoints simultaneously is really impossible. The mega-viewpoint is another image of the holoïd -- the ideal interpenetrating whole -- and it is the holoïd that is posited as confronting the whole of spacetime. When spacetime is viewed as a frozen plenum which is impossible for anything within it to see then all the positions within it are still. But we can really only experience part of the mega-viewpoint and part of spacetime within which we see still points as moving. So we reach a limit similar to the limit of stage one. The container spacetime with cartesian coordinates projected on it within which dynamic systems appear which can be modeled with only four viewpoints throws us back inward in an attempt to understand the relation between the minimal methods and the turing machine and in turn their relation to embodiment within the matrix that underlies spacetime/timespace. But by reaching this limit we are able to now turn back because now the matrix has split and the Catalyst viewpoint has bifurcated again raising us to a new level of complexity at which illusory continuity is generated. The illusory continuity of the operating turing machine and of spacetime is the product of ideation. When we look back into the interval between stages one and four we see into the inner workings of ideation as it produces that illusory continuity. We see that we are at a point of reversibility which throws us back again into the interval in order to understand how the minimal system of viewpoints works and how that minimal system of viewpoints is embodied within spacetime and can have a view of positions in spacetime which are still from all inertial frames though they are locally moving.

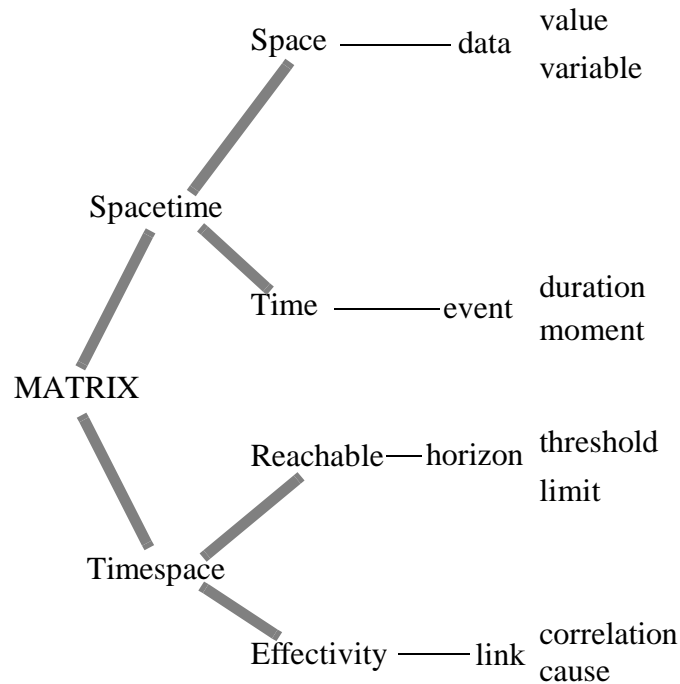
## 12. The Bifurcations of the Matrix.

In effect what this essay will attempt to engage in now is a derivation of the minimal methods for software design. It has already been shown how the state machine and petri net minimal methods were derived from the interaction of the functional and agent viewpoints. Also the mapping and virtual layered machine minimal methods appear as bridges between these two viewpoints. However, for these minimal methods to arise the embedding into spacetime was not a prime consideration. But by reaching the fourth stage we see that the bifurcation next level of bifurcation of the Catalyst viewpoint appears along with the embedding in spacetime so that a whole new set of minimal methods are generated as the bridges between the full set of the minimal system of viewpoints. But also our approach must be different now because we are essentially rebounding from the introduction of infinity and the illusion of perfect continuity that appears at stage four. So we must on the rebound begin again and consider the bifurcation of the matrix. The matrix is the source of spacetime and timespace. These are two views of the matrix. Spacetime is three dimensions of space minus the dimension of time. Timespace is the Minkowski version which concentrates on causality. It contains past minus present minus past plus nowhere. These are two distinct ways of looking at the matrix. Spacetime is reified into space and time which are viewed computationally as data and event. Timespace is reified into reachability and effectivity and is computationally reified into horizon and link. The combination of data and event is the eventity. The combination of horizon and link is a region. The data entity bifurcates into value and variable. The event bifurcates into duration and moment. The horizon bifurcates into threshold and limit. The link bifurcates into correlation and cause. Through these bifurcations we get a picture of an eventity within a region which comprises a situation. A given eventity is composed of data and events within space and time. The data is represented as a value of a variable. The event is expressed as a duration composed of moments. The relation between durations and moments is called by William James the specious present. There is no infinitesimal moment. The minimum grain is the clock cycle. Eventities find themselves in situations. In a given situation the eventity has an effective region. The region is the distance that is reachable in a given amount of time within which the eventity could be effective. Reachability appears concretely as a horizon to the eventity across which things manifest when they become reachable. Effectivity appears concretely as links which allow the eventity to effect something else. A horizon is composed of thresholds and limits. Thresholds are important points of reachability within the limits of what is ultimately reachable. Links appear as either



correlations or causes. Causes are very strong correlations.

Figure 33: Bifurcation of the Matrix



The bifurcation of the matrix makes available to us the concepts we need to consider the relation between spacetime or timespace as a container and the eventivity. Basically the eventivity is located in spacetime but it has its effective relations with other eventities that it can reach through timespace regions. The combination of location in time and space along with effectivity and reachability is the way a situation is defined for a given eventivity. To make this description computational all we need to do is consider space to be memory and have it filled with information values. The model that uses light to implement turing machine tapes gives a direct transformation of the concept of container space as an information container related to computation.

Now having broken down the matrix into subsidiary concepts through a progressive bisection we can begin to explore the minimal methods related to event and data. It turns out that there are two minimal methods relating the event viewpoint to the data viewpoint on any software system. These two minimal methods again subdivide into to sub-minimal methods each. These have been discussed at length in my papers on Software Engineering Foundations. Basically there is the design element flow sub-methods and the information flow sub-methods. These are

pictured in adjacent figures. The design element flow sub-methods have two versions. One (t) sees state transitions for each design element between global system states. The other (u) sees global system transitions between sets of design element states. These two sub-methods define a minimal method that sees data from the point of view of event which is to say data are seen as transitions between states. The information flow network sub-methods also have two versions. One (s) watches the changes in value of two variables in relation to each other. The other (r) watches the values flow through a network of variables. The information flow network method sees event from the point of view of data, i.e. event is changes in data variables. Now these two minimal methods with their internal duality are the ways data embedded in time and time is embedded in data. They are the way any computational system is embedded in spacetime or timespace. And what is interesting about that is each of the sub-methods use all the concepts that fall out of the bifurcation of the matrix. Thus the information flow sub-method has some aspect that corresponds to each of the leaf node concepts that falls out of the bifurcation of the spacetime/timespace matrix. And this is true of each sub-method in a completely different way. So we may say that each of the sub-methods (r, s, t, & u) are complete embeddings in the matrix of their computational structures. And beyond this we can say that the combinations of these sub-methods provide the basis for embodiment of each of the minimal methods.

- state machine =  $s/t$
- petri net =  $r/u$
- dataflow =  $s/u$
- darts<sup>1</sup> =  $r/t$
- worldline and scenario =  $s/r$
- mapping and vitural layered machine =  $t/u$

Thus even though the minimal methods themselves are empirically selected as bridges between viewpoints their computational embodiments can be derived from the combination of sub-minimal methods bridging between event and data viewpoints. This is a very important finding. The actual proof will not be presented in the body of this paper due to its length but will be relegated to an appendix. But once accepted it gives us a view of the minimal system of viewpoints that arises at stage four that is much deeper than that we held before. Basically we see a lattice that has the following features.

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1.Design Approach for Real-Time Systems, See Hassan Gomma and Software Productivity Consortium (ADARTS)

- One Catalyst proto-viewpoint
- A minimal system of four viewpoints (AFDE)
- Six methods based on pairs of embodiments
- Four embodiments using all aspects of the matrix
- One Matrix

This lattice of concepts allows us to see how all the stages work together to produce embodied computation. The six methods produced out of pairs of embodiments are all partial turing machines. None of them contain the full continuity of the turing machine with its infinite (in one direction) tape. But each of them give an essentially different representation of computation that is necessary to picture some aspect of the real-time software system. One point that is interesting is that we can go beyond these methods which are all basically two dimensional and envisage three dimensional macro-methods that are based on three embodiments minus one embodiment. Thus each of these four possible three dimensional methods are images of spacetime or timespace.

- **r+s+t-u** lacks macro-transitions and micro-states
- **s+t+u-r** lacks information network
- **t+u+r-s** lacks information flow
- **u+r+s-t** lacks micro-transitions and macro-states

These possible three dimensional methods are in fact the contexts of each of the embodiments containing all the embodiments other than the one under focus and it could be that it is impossible to actually construct such three dimensional methods because of the exclusion which prevents you from being in more than one viewpoint at a time when viewing a software design.

Now we are able to look at the minimal methods as partial structures of turing machines and see them as combinations of computational embodiments. Anything that can be computed by an effective procedure can be computed by a turing machine. That computation is not abstract but is actually embodied in spacetime via the four embodiments of data and event where data has two ways of viewing event and vice versa. This is why software design minimal methods are effective. They express the relations between computational embeddings. Each embedding fully expresses the structure of the matrix. Two embeddings play those structures of the matrix off each other in qualitatively different ways. Three embeddings provide the context for any one other embedding.

### 13. General Systems Theory

We have been speaking in terms of software design minimal methods. However, as has been show elsewhere<sup>1</sup>, that software engineering and general systems theory are dual meta-disciplines that need each other. Robust general systems theory such as George Klir's must use software to simulate systems architectures. Software is used in all disciplines to simulate and enable but it always appears as systems. Pieces of software that are not systems out of context are useless patterns of ones and zeros. So when we talk of software methods we are talking about the designs for the embodiment of general systems models or some system model from a specific discipline. Systems models using software animate conceptual structures that would otherwise be static. So our stepping through the stages based on the unfolding of methodological distinctions gives us a unique view of all possible systems models. As George Klir says any given system model must make use of backgrounds and attributes that are selected for a particular system under study. These are converted into supports and variables which allow us to produce coherent data streams. These data streams allow us to begin to analyze the system using the epistemological framework developed by Klir which causes us to advance by two horns toward infinity as we produce higher and higher level meta-models and structural systems or mixtures of these. Every concrete approach to a system must be based on the methodological distinctions and they fundamentally effect our view of the systems we study. By stepping through the stages of unfolding of the methodological distinctions we have seen that when we reach full ordering we also introduce the infinity. At the same point we attain full computational strength and a continuous spacetime within which we can pinpoint the different parts of the system and how they are moving. If we consider the system causally from the point of view of timespace we get fully linked and reachable regions that encompass the system and allow all parts to effect all other parts producing correlated and causal phenomena based on the limits and thresholds within the system.

So we can take a more global view and say that every system can be seen as stepping through the stages of methodological distinctions unfolding until we reach the point where we can give a robust model of it within a continuous container of spacetime, based on linked eventities with each others mutual horizons, and which can be effectively computed using a turing machine representation to imitate its dynamics. But even though we think of all systems as being within a continuous

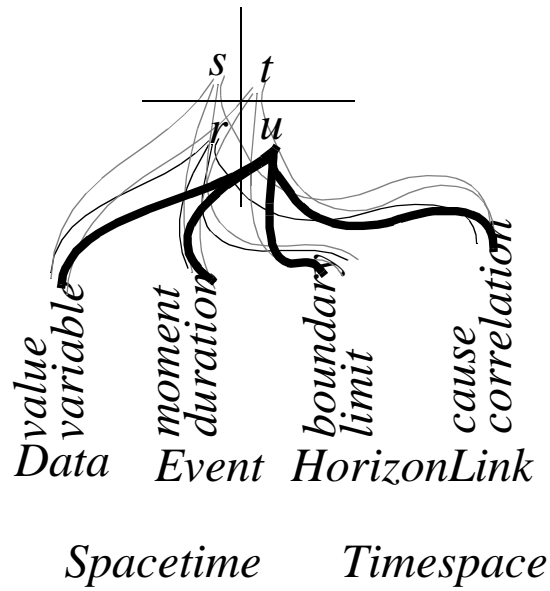
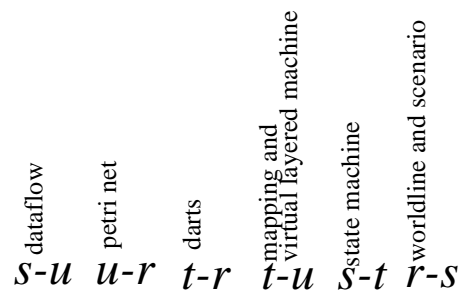
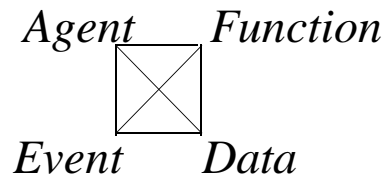
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1. Klir paper

spacetime container and effectively linked within mutual horizons this is not always the case. In fact there can be systems based on restricted methodological distinctions that do not exist in fully ordered spaces. For our systems theory to be complete we must take into account these other possibilities. And in fact by taking them into account we provide an account of the development of our systems theory out of its fundamental roots by stepping through each stage at a time and constituting out systems theory as it genetically unfolds with the unfolding of the methodological distinctions.

Figure 34:

# *Catalyst*



## *MATRIX*

The tendency is to look at recursively enumerable degrees that lie above the level

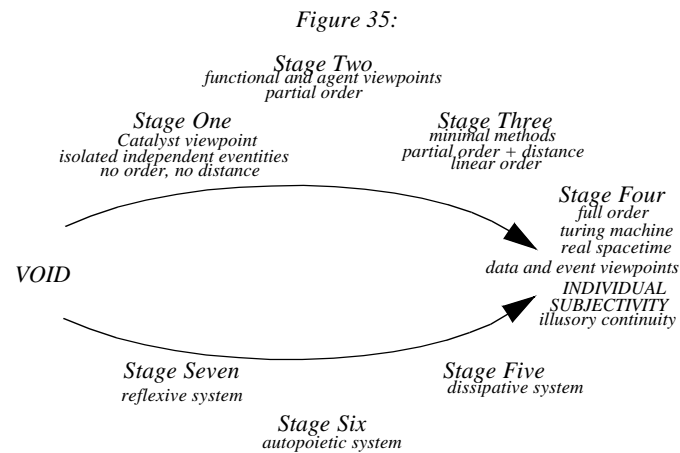
where the Turing machine comes into existence. Soare has done this and has developed methods for specifying the degrees of computability very exactly. We can see this as an exploration of the space above the threshold of computability where the turing machine and the container spacetime/timespace come into existence. It assumes the continuum of computability and the continuum of real numbers based on the interjection of infinity on the turing machine tape or in the articulation of dimensions. In this study we take a different route which sees the arising of computability and of methodologically distinguished measures as occurring by a series of stages. In these stages we see the order of what can be measured increasing step by step up to the emergence of the fully ordered real number line. But also in these stages we see the substructure of the turing machine composed step by step. This substructure is composed of minimal methods associated directly with embeddings by which they are manifested computationally. Thus we approach the threshold of computability and of measures of spacetime/timespace and rebound from it. We rebound because the Catalyst viewpoint is progressively bifurcating. First it produces two viewpoints and one methodological distinction, then it produces two methodological distinctions that are the basis for all minimal methods, and finally it produces two more viewpoints and another methodological distinction. At this final stage all of the rest of the methodological distinctions become possibilities and there appears a minimal system of viewpoints which gives us a complete picture of the lattice of embedding by which the methodological distinctions interface with the matrix of spacetime/timespace. Once this complete structure is manifest we move into a realm in which we can extend out computation to various degrees within the spacetime container and by reductions of computing devices to the turing machine. The structure is the basis for any general systems theory that is founded on the computational simulation of dynamic systems. Dynamic systems appear as located in container spacetime and the turing machine computes the dynamics. The architecture of systems such as Klir studies becomes the architecture of simulations of systems which is grounded in their data representations. Klir's epistemological lattice gives an articulation for our general computational simulation of any physically realizable system. But our focus is not on the ability to simulate any possible dynamic system. We take it for granted that at stage four where turing computation and container spacetime arises that both meta-disciplines of General Systems Theory and Software Engineering become effective. We are more interested in exploring the substructure below this threshold of illusory continuity. We have already shown that within this substructure a minimal system of viewpoints is constituted and that a set of minimal methods necessary for defining any dynamic system is generated as partialities of

turing machine. We have shown that each of these minimal methods are based on a computational embodiment that connects it to all the aspects of spacetime/timespace. Each minimal method is comprised of two interacting embodiments which each in a different way expresses a complete embodiment of spacetime/timespace. All the interacting embodiments together form the basis of the turing machine. Three embodiments opens up the possibility of three dimensional representations of real-time systems, something that has not yet been defined but may be useful for modelling real-time systems in a new generation of design tools that are based on virtual reality techniques. By backing away from the threshold where illusory continuity arises in our series of stages we have been able to derive the minimal methods from the combinations of the four embodiments. And this also frees us up to move in a different direction. We shall consider the lattice that produces the illusory continuity of the turing machine and container spacetime as a point of departure to explore the possibility of defining specialized systems theories. The lattice has allowed us to define a general systems theory built up in stages of the unfolding of the methodological distinctions. That general systems theory once defined can be used to model the architecture of any system realized in spacetime/timespace. But the question that will arise soon is whether we can go on to define more specialized theories of systems that give us rigorous definitions of the dissipative, autopoietic, and reflexive systems. For now we are still exploring the general systems theory that has now been given rigorous formulation. That formulation says that the way we measure systems is fundamental. Different kinds of systems appear phenomenologically as we introduce each methodological distinction. These methodological distinctions based on order and distance of eventities do not say anything about the nature of the eventities that combine to show different degrees of distance and order. This is a strictly non-essentialist theory that merely says that if you are going to measure a system there are stages of the constitution of measurement and that these stages in the end give you turing machine computability and continuous spacetime/timespace. But on the way to that most general kind vantage point onto systems that are simulatable and are realized in spacetime/timespace there are these very specific stages which tell us a great deal about the substructure of ideation and make our systems theory more general still. Instead of our systems theory being merely all possible systems architectures and merely mentioning the difference between methodological distinctions in passing as Klir does, we take a genetic view of the constitution of systems as we see them unfold phenomenologically from the first stage of no order no distance on to full ordering with complete ordering and distance. We can do this because we have applied the Perician-Fullerian categories which gave us a framework for



considering how this unfolding of methodological distinctions works and how it is linked to the unfolding of viewpoints. These viewpoints are the basic supports that appear as backgrounds for the measure of a real-time system. The minimal methods are the basis for relating design elements to these background supports. They allow us partial views of the design of the real-time system or the dynamic system which we are simulating. They are truly partial machines which express requirements or what Deleuze and Guattari call desiring machines. These desiring machines in Deleuze and Guattari's theory are related to the socius or the social nexus. The individual is illusory and is merely a collection of desiring machines. Here we see the key point which is that turing computability and the continuity of spacetime/timespace is an illusion like the illusion of subjectivity. We need to back away from that illusion and explore the sub-structure of that illusion. In that substructure we see desiring machines clustered together and interacting to form a socius and in which all individuals as subjects, even as bodily wholes are illusory constructions. What we want to do is show that connection to the socius. The socius is above the level of the illusory individual but we need not pass through that level in order to produce it. It is as if instead that the level of illusory continuity was constituted from either side. It is constituted by the partial objects or desiring machines from one direction and it is constituted by the social layer from the other direction. These two distinctly different sources interact to produce the illusion of the individual subject suspended in the illusory continuity of the designated as real world. And this is important because that illusory continuity is exactly what constitutes our involvement in the world. So our general systems theory is also a theory of worlding worlds to the extent that it produces the illusory continuity that allows us to project the world as a unified illusion. The projection comes from two sources. One is below the level of the individual who is computable in spacetime/timespace and one is above the level of the individual at the level of emergence of the social. Now if we continue to construct the fifth through seventh stages to account for the dissipative, autopoietic and reflexive special systems we are not necessarily thinking foundationally as if this unfolding must constitute each stage emergently out of the last. In fact we consider that the whole lattice can be turned on end so that we could begin by looking at the social first and successively deriving the lower level stages. In fact we submit that the social is fundamental and that working from both ends of our lattice we constitute the illusory continuity of the computable individual within spacetime/timespace. This allows us to see that our work of providing an ontological substrate for the social in terms of tendencies in the prior essay was not for nought. We have seen that the functional viewpoint is synonymous with intentionality and that it is intertwined with the issue of autonomy

as seen from the agent viewpoint. And sure enough it was intentionality that was give its own categorical status by Johansson. Now we see that the social is based on the category also posited by Johansson of tendency. These two are brought together by vector addition as a means of resolving tendencies into final intentions. But what is key is that the constitution of the individual which is taken by Deleuze and Guattari as illusory is based on two grounds. It is based on the ground of the partial objects or desiring machines and it is based on the ground of the socius. The partial objects and desiring machines are constituted in stages one thorough three of the unfolding of the methodological distinctions. They are equivalent to our partial turing machines which are expressed as embodied minimal methods. The other horn of constitution of the illusory individual will be given in stages seven thorough five which are based on the socius and that is grounded in the Johansson category of the tendency. The key question is where do desiring machines get their desire. Desiring machines combine intention with tendencies to produce the nodes of autopoietic networks of partial machines. The result is the illusion of a unified individual. But the lack of real unity of that individual is a sign of the operation within it of the void -- an essential rift or a wound that can never be healed.

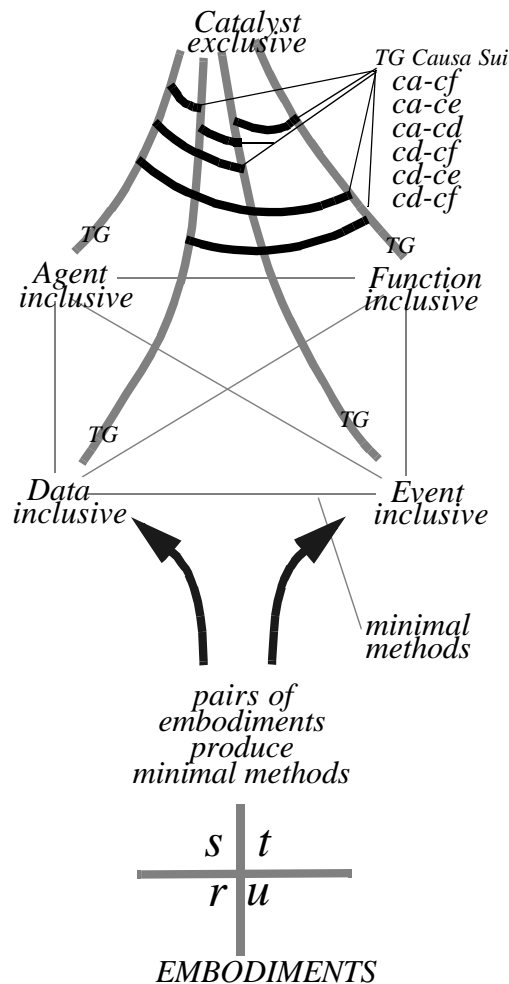


Now we need to explore just a little bit the connection between the minimal system of viewpoints and the Catalyst proto-viewpoint. We return for a moment to recall Johansson's definition of the temporal gestalt and the temporal gestalt causa sui. We remember that the temporal gestalt was a combination of a temporally inclusive quality with an temporally exclusive quality. Now we notice right away that the Catalyst viewpoint is temporally exclusive and the other viewpoints are temporally inclusive so that each relation between the Catalyst viewpoint and the members of the minimal system of viewpoints is a temporal gestalt. A temporal gestalt causa sui is the relation between two temporal gestalts. Thus between the viewpoints and

the Catalyst proto-viewpoints there are six temporal gestalts *causa sui* defined. These temporal gestalts *causa sui* appear as self starting qualities that when one temporal thing occurs another spontaneously is jump started. This self-jump starting when given in a ring of temporal gestalts *causa sui* forms a hyper cycle. The hyper-cycle is an image of the autopoietic system. It catalyzes itself. Thus the Catalyst viewpoint realizes itself in a ring of temporal gestalts that are all mutually dependent. It is an image of dependent arising were the whole ring must arise together and is bound together by mutual causal relations. Such a hyper-cyclical ring is the fundamental basis for constructing higher level stages that will define the dissipative, autopoietic and reflexive system. But notice to realize that description we are not moving out toward the horizon of computability and continuity but inward, into the sub-structure of the lattice that connects the matrix with the Catalyst viewpoint. We see that it is temporal gestalts *causa sui* that are the basis of this new direction along which we can define more specialized systems. By defining the six temporal gestalts *causa sui* we see that these line up over against the six embodiments of minimal methods. We say now that the minimal methods cannot be reduced to the combinations of embodiments and that they each embody a synthesis that is not fully captured by their embodiments. This synthesis over and above the embodiments that is the essence of the minimal methods is expressed by the six temporal gestalts *causa sui*. They form an interlocking network of partial realizations that has both a simple and a bodily aspect. The simple aspect is the temporal gestalt *causa sui*. The bodily aspect is the combinations of embodiments that give rise to the minimal methods. It is really the combination of these two ways of defining the six two-way methodological bridges that give us the five dimensional sextahedron structure of the second order autopoietic ring. The first order autopoietic ring is the pentahedron in four dimensional space. The five dimensional equivalent of the tetrahedron has a lattice form which is 1-6-15-20-15-6-1. This lattice can be read either direction laying on an interpretation of point, line, plane face, solid, hyper-solid. Thus this figure has fifteen solids (tetrahedrons) and six hyper-solids (pentahedrons). The two sixes are set equal to the temporal gestalts *causa sui* and the six embodiments upon which the minimal methods are based. The twenty is the same as the number of nodes in the five tetrahedrons of the pentahedron. So we see here that the nodes of the pentahedral autopoietic ring become the faces of the sextahedral geometrical form. These are equivalent to the twenty sources beyond mirroring and reversibility of the I Ching or the twenty Mayan day names. They are equivalent to the combinations of the five hsing and the four elements. The six simples of the temporal gestalt *causa sui* and the bodies of the six embodiments do not have a simple pattern of combination but from a

higher order geometric lattice that defines the twenty source forms. They are the nodal points at which the five celestial causes interact with the four terrestrial receptivities. They are the points at which the yin in the yang interact with the yang in the yin. The celestial causes (five hsing) interact with the four elements through which the Li of all things is expressed. Cosmologically this is the interaction of the planets with the stars.

Figure 36:



You might feel as if we have just fallen off a cliff into astrology and other undesirable pseudo-sciences. However, what we are getting at there is very deep and needs a special language to speak of it. It turns out that many ancient cultures had such a language and it was misunderstood and turned into the epitome of charlatanry by the rise of Western science. But what we are talking about is very simple. Johansson has produced a way of talking about Temporal Gestalts Causa


Sui which are basically combinations of exclusive and inclusive temporal qualities which are then combined again to give us a view of the jump start mechanism of hyper-cycles. Now we are merely taking the same kind of concept taken a bit further. We already know that there is yang (primary causation), yin in yang (secondary causation of invisible causes), yang in yin (Li), and yin (Chi). When Johansson posits the possibility of temporal gestalts causa sui he has opened up the door to defining even higher level relations between temporal gestalts causa sui. We have in fact happened across one of these higher level relations where we have a set of temporal gestalts causa sui (six to be exact) interacting with a set of six pairs of embodiments. In order to put this into a lattice structure we have to go down Pascal's triangle till we reach the lattice that embodies the sextahedron in five dimensional space. That lattice has twenty nodes between the two sixes mediated by fifteen in both directions. The twenty can be interpreted geometrically as surfaces starting from either end of the lattice. It turns out if we look back down at the next lower line in Pascals triangle we see the lattice for the pentahedron in four dimensional space. That pentahedron has five tetrahedrons and thus rotated out of the fourth dimension there would be twenty separate points that are represented by five reused. What are twenty points in four dimensions are now twenty surfaces in five dimensional space. These surfaces represent the interaction between celestial causes and embodiments. There are five celestial causes called Hsing and traditionally four embodiments earth/air/fire/water. The twenty interactional nodes appear as the point of connection between the six Temporal Gestalts causa sui and the six embodiments. These are the next levels deeper into the tetrahedral lattice produced by the unfolding of the methodological distinctions that lead to the arising of the minimal system of viewpoints and their embodiment in the lattice. We can see by this that there is a different direction to go besides out into the illusory continuity of container space and computability. We can follow Pascal's triangle deeper and see the various lattices produce an infinite series of interpenetrating structures rolled up within the minimal system of viewpoints embodied in the matrix.

However, this new direction following Pascal's triangle to deeper and deeper levels of interpenetrating structures rather than out into the realm of illusory continuity, must be approached carefully. Otherwise we might merely fall off into the mystical without seeing the point of looking at things in this way. These concepts taken from Chinese and Islamic sciences are actually very sophisticated but expressed in a deceptively simple language. We need the right line of approach to see things from a vantage point that combines the insights of the East with those of the West in a

way that makes sense to everyone. Therefore, we will return to our elaboration of the emergent stages and build step by step the remainder of our stages. Hopefully we will be able to produce a framework that will make it possible to assimilate these concepts. But here we merely want to show that there is an alternative to building out into the illusory continuity produced by computation and the container space. Instead we can go deeper into the embodied minimal system of viewpoints and we can see how that is done because we can produce the six temporal gestalts *causa sui* and the six embodied minimal methods and we can see that these participate in a higher dimensional lattice that defines all the possibilities of their interrelation. The nodes of interaction that appear define the twenty source forms that govern the interaction of the five *hsing* with the four elements. The five *hsing* are the fundamental yang transformations. The four elements are the fundamental yin receptivities. The twenty surfaces of interaction give us all the possible logical kinds of interaction of heaven and earth. This is basically the internal structure of interaction of secondary celestial or unseen causes with the *Li*. It is the interaction of the yin in the yang with the yang in the yin. Chinese and Islamic science traditionally dealt with these subtle interactions rather than gross physical tertiary causes that Western science works with. The interaction of secondary invisible causes and the fundamental pattern expressed in the *Chi* as *Li*. The *Li* can only be manifest because of the receptivities in the *chi* that allows order to be embodied. The *Li* is an ordering that rises up within the flows of the *Chi*. That ordering is the reflection of secondary celestial causes interacting with the yin *Chi*. As we explore this realm more fully we realize that we have opened up the possibility of establishing a common basis for the Western science of special systems (i.e. dissipative, living, reflexive) and the Chinese and Islamic sciences that have for centuries been concerned with subtle energies and diagnosis of self-steering dynamic systems. However dealing with higher level concepts than the temporal gestalt *causa sui* is difficult and must be approached with caution in order to get the right sense of it and this can only really be done in the context of a definition of the specializations of general systems theory that allow rigorous definition of the dissipative, autopoietic and reflexive systems.

Figure 37:

<i>dimension</i>	<i>1</i>	<i>source</i>
0	1-1	point
1	1-2-1	line
2	1-3-3-1	triangle
3	1-4-6-4-1	tetrahedron
4	1-5-10-10-5-1	pentahedron
5	1-6-15-20-15-6-1	sextahedron



However, so as not to leave the reader hanging we let us lay out the progression down into the infinite regress of Pascal's triangle once again. We have established the tetrahedron of fundamental viewpoints on every real-time system. We have also established the minimal system of embodiments. It turns out that the embodiments can be combined six ways to give the embodiments of the minimal methods of software design or real-time system modeling. It also turns out that we can define six temporal gestalts causa sui by considering the relations between the Catalyst proto-viewpoint and the minimal system of viewpoints. Thus we have two sets of sixes one composed of simples and the other composed of embodiments. We posit that these are not just directly related but combine through the lattice of the sextahedron in five dimensional space. But this leads us to question the relation of the sextahedron to the tetrahedron of viewpoints or of embodiments. We see that there is another figure between these two extremes which is in fact very important because it defines the structure of the autopoietic ring. That is the pentahedron of four dimensional space. The pentahedron gives the structure of the minimal autopoietic network. An autopoietic network is composed minimally of five minimal systems or phases. It is composed by considering the Catalyst viewpoint to be on the same par with the other viewpoints. If we substitute the Catalyst viewpoint for each of the others in turn we get the five phases. So the viewpoints stand opposite the phases where the viewpoints are mixed. In this way the pentahedron sets up a relation between the celestial causes (Hsing) and the terrestrial receptivities (elements). The pentahedron embodies this fundamental relation generating twenty archetypal kind of interaction. These twenty kinds of interaction appear as surfaces in the sextahedron. The sextahedron represents the six ways the interaction between heaven and earth can be embodied. Here instead of static viewpoints we have temporal gestalts causa sui as the celestial element. Instead of receptivities we have the six embodiments. The same twenty basic kinds of interaction appear to mediate the relation between the six embodiments and the six temporal gestalts causa sui. The twenty kinds of interactions appear as surfaces rather than points. Each surface connects three temporal gestalts causa sui. Each

surface may act as the interface between the point that juts out into the fifth dimension and one of the pentahedrons that are four dimensional shadows of the sextahedron. The phases of the sextahedron are four dimensional. They are separated from each other by the temporal gestalts causa sui. The six embodiments and the six temporal gestalts causa sui interact in a way that sets the pentahedral relations between heaven and earth in motion.



Figure 38:

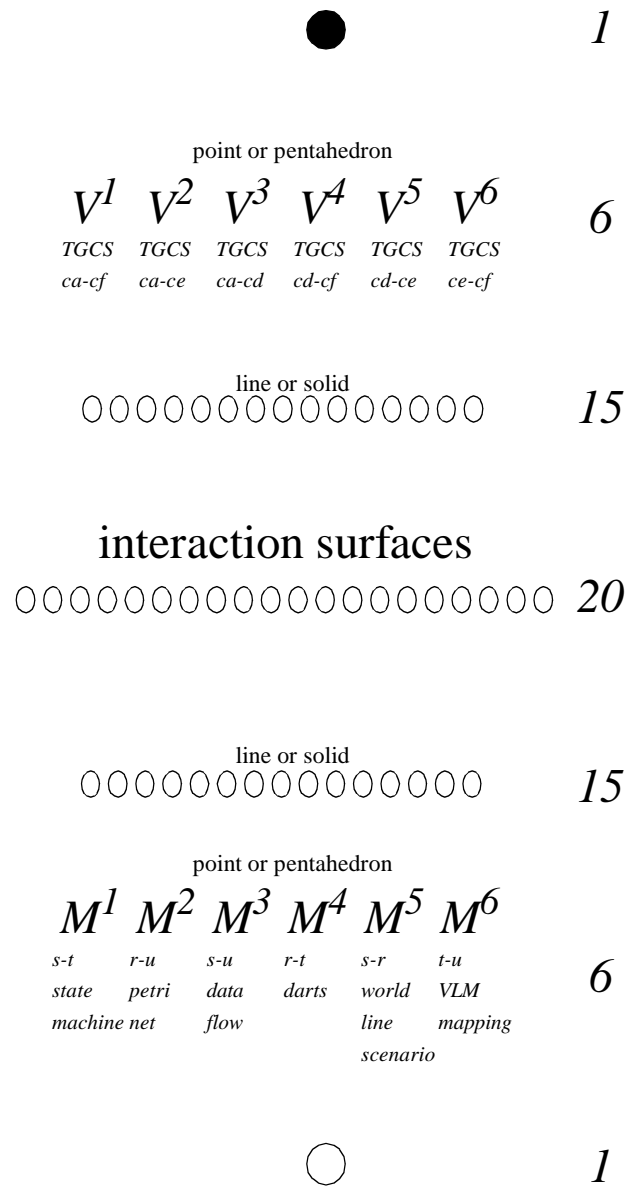


Figure 39:

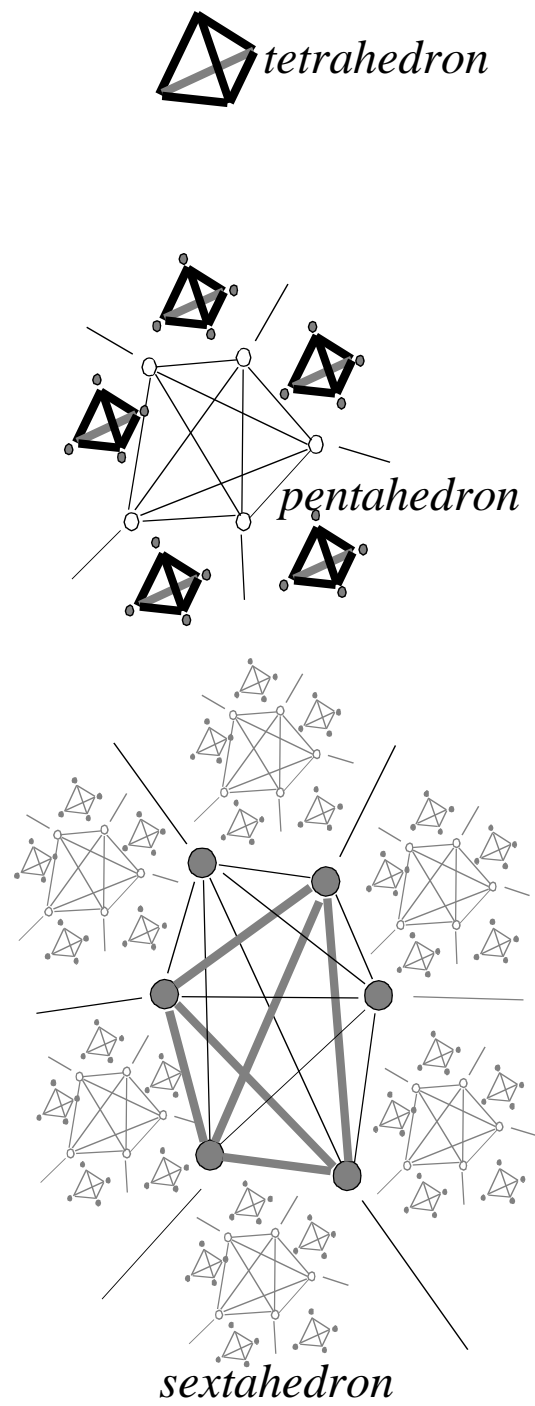


Figure 40: The six pentahedrons in a sextahedron

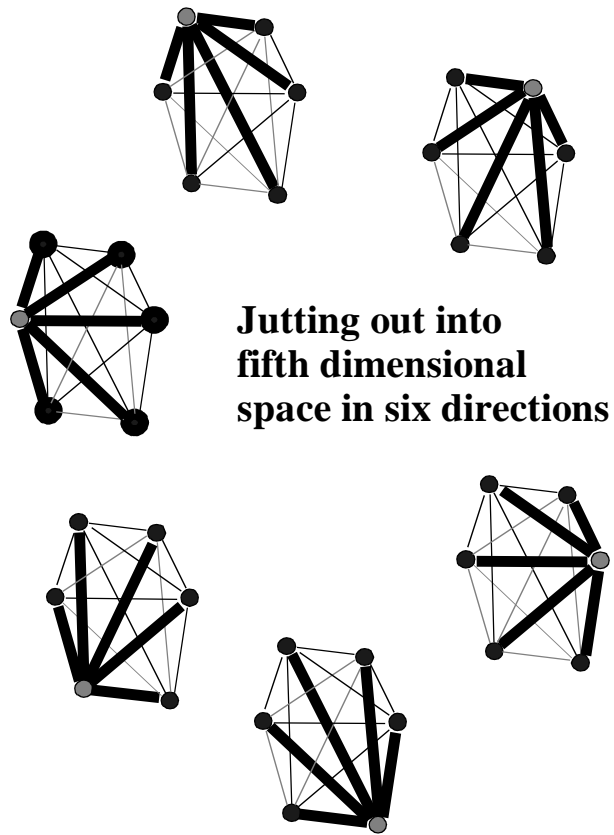
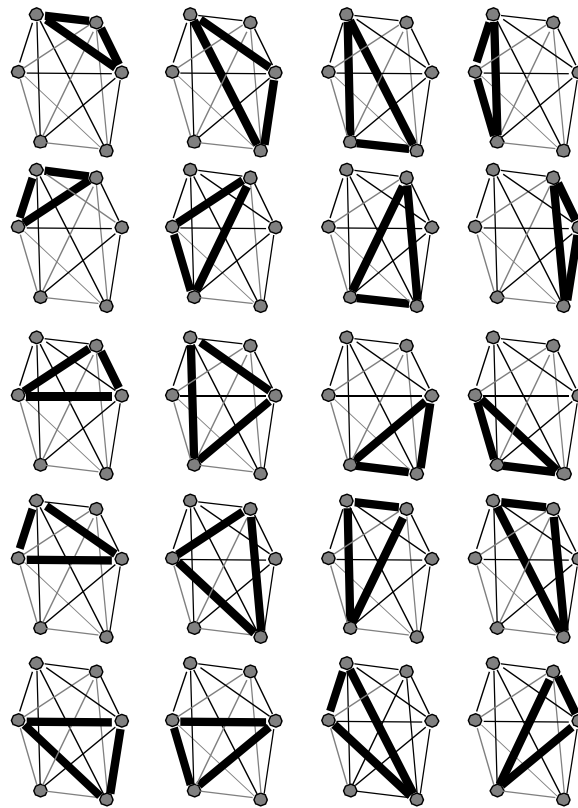


Figure 41: Twenty Interaction Surfaces.



## 14. Stage Five

Enough wildness for the moment. Now we return to our construction of the stages. But since we have run out of methodological distinctions the question comes how do we extend our four basic stages any further. The key is to change gears and consider another basic feature of our ordering capability that has come to light with the advent of the real number system. Now we move from kinds of measures to considering more complex orders of real numbers. These are defined by the kinds of algebras that can exist to relate different number systems. Now we know that algebra arose with the agent viewpoint. And we also know that logic was its opposite. Thus if we concentrate on algebras now we should expect a similar emphasis on logic in some form or another. We know we can have a definition of a normal algebra with real numbers. We can also extend logic to fuzzy logics to produce a continuum between true and false. So just as real numbers allow us to track things in the real world so to fuzzy logic allows us to get even closer to our use of judgement. In fact, within the real continuum we can see that determinate, stochastic, fuzzy and chaotic numbers can be applied. These kinds of numbers also

relate to different possible kinds of automata as shown by Watanabe. So we have a full range of different kinds of modeling which relates to our different modalities of Being. Thus we have effectively a different kind of number for each human modality for relating to the world.

But there are different kinds of algebra and here we will begin dealing with more esoteric algebras as a means of extending our lattice of methodological distinctions. It turns out that beyond real algebra there is complex algebra, hyper-complex and hyper-hyper complex algebras. Each of these algebras are progressively weaker. But they each mark an specific threshold of complexity beyond the threshold of illusory continuity. We will step out through these thresholds of complexity defined by hyper algebras one at a time and attempt to see their importance.

The first stage beyond the threshold of illusory continuity is the complex numbers and their algebra that allows us to define the square root of negative one. This allows us to solve some equations that otherwise would remain insoluble. But it does more because there are many natural phenomena that are aligned in some way with complex numbers like electricity for example. The complex numbers describe the rotations in four dimensional space. Thus by moving from the real numbers to the complex numbers we are allowed relations that cannot happen in normal three dimensional space. Four dimensional rotations allow something to rotate into its enantiomorph (mirror image) which is not possible in three dimensional rotations.

Now this threshold of complexity is definitely beyond the real numbers but this is achieved by introducing a fourth dimension within which the algebra operates by keeping the real numbers and the complex numbers linked but separate. We link this threshold of complexity to the dissipative system and what will be called the openly closed system. The dissipative system is either a catastrophe in which entropy pours into a system or a system in which entropy pours out of a system. In the latter case order appears as if from nowhere. This order from nowhere is the sigh of an unseen celestial cause. It is as if there were a four dimensional pathway into the system from the inside without breaking any of its boundaries. Thus the system is open to the introduction of order from nowhere but closed as the dissipative boundary creates a barrier through the surge of entropy projected outward into the environment. The dissipative system establishes its boundary by pouring entropy into its environment at a rate similar to the rate by which it introduces order from nowhere internally. The dissipative system is dependent on this balance to maintain its existence. The dissipative system is by definition out of

balance. It is a dynamic balance which is constantly falling ahead of itself and catching up with itself as ordering produces disordering.

The dissipative system's boundary is like a twist in a mobius strip. That twist is well defined by the structure of the complex number system. complex numbers at a particular point yield real numbers again. That point where real numbers are yielded when you combine complex numbers is a twist in four dimensional space. It is that twist that allows the boundary of the dissipative system to exist. This is because order is being thrown out into the environment and that by some unknown mechanism allows order to be pulled in from four dimensional nowhere. The boundary of the dissipative system is a four dimensional boundary not merely a three dimensional boundary. This is what distinguishes it and makes it a special kind of system within the panoply of all possible systems.

At this stage we introduce the idea that a tetrahedral system can have four different guises: tetrahedron, mobius strip, knot, and torus. Each of these represent 720 degrees of angular movement which is  $4\pi$ . Four  $\pi$  is the minimal necessary movement to appear to be standing still in spacetime. Each of the different geometric appearances of the minimal system represents a different kind of receptivity in the Yin sensible earth.

## 15. Stage Six

The next stage is defined by the Hamiltonians or the Quarternions. These are hyper complex numbers. Hamilton put up a plaque where he discovered them while on a walk by a canal. They are three complex numbers all interrelated like the complex numbers only more complexly infolded into each other. Thus instead of two independent kinds of numbers there are four ( $x, i, j, k$ ). You get the Quarternions by doubling the complex numbers. The algebra of the Quarternions is weaker than that of the complex numbers. They also have their uses but are less useful than the complex numbers. But what we really see in the quarternion numbers is a double twist which turns the mobius strip into the Klienian bottle. Here the dissipative system becomes closed and we have an autopoietic system. I posit that it is this threshold of complexity that defines the autopoietic systems internal structure. Here the dissipative waterfall like those of Escher feed themselves and produce perpetual motion machines. The autopoietic system is a perpetual motion machine constructed by adding two opposite four dimensional twists to each other. This explains a lot of things about the autopoietic system like why it must pop into

existence and pop out of existence. It also explains how it could produce itself. It merely twists back on itself through four dimensional space. And since the fourth dimension can be seen as time the self-production of the autopoietic system is merely its rotation through time.

At this stage we introduce the concept that the pentahedron itself has four guises analogous to the guise of the tetrahedron. Its main guise of interest is that it contains at its core a Kleinian bottle that is two mobius strips intertwined. These intertwined mobius strips are inscribed on the surface of the pentahedron as its surfaces connect to form these two mobius strips. It also has images as the thirty two pentagrams corresponding to the interference pattern of the knot. The pentahedral structure itself corresponding to the tetrahedron. And finally five groups of twenty elements. There are only five kinds of groups of twenty elements. So the twenty basic interactions are represented as an interlocking group structure. The quality of those basic twenty interactions are represented by the thirty two pentagrams. Thirty two qualities in twenty places. The fact that the pentahedron contains a Kleinian bottle is very significant because the Kleinian bottle is the image of the autopoietic system turning in on itself in its self grounding motion.

## 16. Stage Seven

The last stage of the specialization of general systems theory is the positing of the dissipative, autopoietic reflexive system as being related to Cayley Algebras. These algebras involve eight independent kinds of numbers ( $x, i, j, k, E, I, J, K$ ) and is again produced by doubling of the Quarternions. They are sometimes called the Octanion numbers. It is a still weaker algebra than the Quarternions. But it perfectly defines reflexivity because the reflexive system is like a Klienian bottle looking at its own reflexion. It allows the Klienian bottle to turn inside out by rotating through itself. Thus the closed system can see itself and become reflexive. The rotation of the Kleinian bottle through itself to turn inside out appears as the reflexive process. This process is essentially social and we can see the marriage of two closed systems as the basis of the definition of sociality. The Cayley structure allows us to avoid solipsism. The inside of one closed system becomes the outside of the other and vice versa. Thus the marriage harmony is based on this possibility that is the basis of all social relationships. When the child enters Lacan's mirror stage he is trapped in the reflection between the two closed systems rotating through each other. They are both one and different at the same time. The Cayley algebras give a precise definition to the reflexive level as a threshold of complexity. This

level of system specialization is inherently social.

## 17. Back to the Void

We notice that as we progressed we combined more and more real like numbering systems together. We gave them different names like i, j, k etc. but these were only symbols that allowed us to differentiate these different numbering systems as we used them together. Basically in each case we are dealing with the real numbering system in different incarnations that we have taught to work together. Structurally there are only three levels above there real numbers that we can construct these alternative algebras. But what we notice is that the separation between the different incarnations are emptiness. There are stark lacunae separating these different numbering systems from each other. Those lacunae are the void creeping back in between the different illusory continua. We have continuity but as we go to higher and higher algebras that continuity is controlled by a higher order set of imperatives that produce radical discontinuities between numbering systems. Those discontinuities between continuities return us to the void. That is the same void that we emerged from with the Catalyst viewpoint and the isolated independent entities.

## 18. Matrix Logic

We have now laid out a progression of stages based on algebra which allows us to define very precisely the threshold of complexity where the dissipative, autopoietic and reflexive systems appear. But we need to understand that these thresholds are not just defined in algebraic terms but may also be defined in terms of logic. Thus we will start over in a sense showing the logical connections to the same series of stages. For this we appeal to August Stearn's Matrix logic to give us a basis for constructing these higher logical levels. It is not possible to review all of Matrix logic here but we will just indicate the connections so that we can go on to see the broader implications of this construction. Stern develops a new basis for logic by combining it with matrix algebra. He basically uses the truth tables of logic to generate matrix logic operators that work upon truth vectors. He expands the number of truth values beyond true and false to cover neither true nor false and both true and false. By doing this and by eliminating what he calls forbidden operations he composes a meta-level logic which is a very significant advance on the traditional logic. We posit that there are three stages in the composition of this new logic which Stern himself develops. There is the vector addition of truth vectors. The vector addition of the four truth values corresponds to the dissipative system. At the level of the autopoietic system is the matrix logic operators which operate



not only on truth vectors but also on each other. The autopoietic system is modeled via what Stern calls the Autoproducts:

Another crucial reason why high-level intelligence resists formalization is related to the autonomous character for intelligent operations. In phenomenological terms this autonomous capability allows an intelligent system to postpone direct responses to stimuli from the environment and to carry out necessary evaluations prior to actions. This is the essential aspect of high-level intelligence which distinguishes it from ordinary data processing, information processing, and knowledge processing.

Taking into account that the autonomous capability in mathematical terms implies a closed loop topology, one may reasonably incline to associate high-level intelligence with closed loop structures. Corresponding closed logic structures can be constructed from linear matrix logic expressions by connecting the last ket vector of an expression with its first bra vector. The proper writing of an expression in closed logic thus will require at least two dimensional representations, with the actual expression taking the form of a circular string or autoprodut consisting of a finite number of bilinear products.<sup>1</sup>

Matrix logic has a direct representation of autopoietic rings. It also congeals into a hyper logic in which four Matrix logic operators form a single Hyper logic operator. This level of hyper-logic is a structure at the same level of complexity as the reflexive autopoietic system. Thus we have with Matrix logic and its hyper-logic extension a rigorous definition of each of the stages described before algebraically from a logical perspective.

Now we cannot here go into all the implications of the relations between matrix logic and hyper algebras except to note that matrix logics are equally mathematical as logical and the matrix operations can be used with complex and hyper-complex numbers as well as real numbers so that there is a blending of logic and mathematics that is possible through the introduction of matrix logic and hyper algebras.

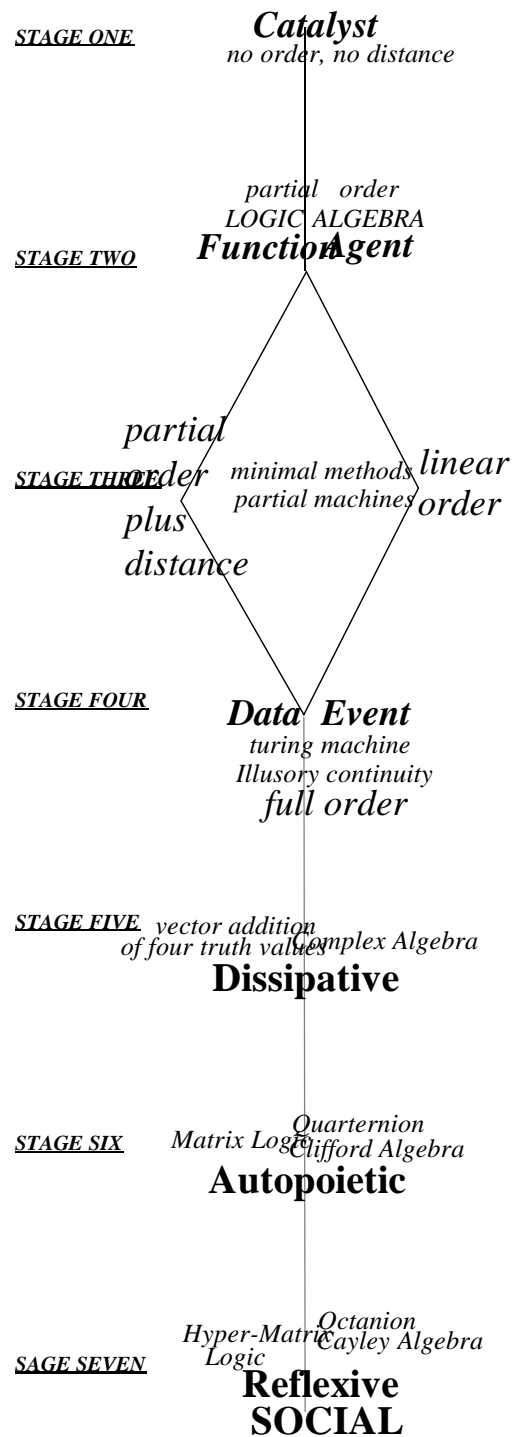
A central point with the introduction of vectors and matrices is that it agrees with Johansson's vision of the importance of vectors and his use of vector addition as a paradigm for understanding the relation between the category of intention and the category of tendency. Here we have merely recognized that vectors are a subset of the matrix and that matrices can be used to manipulate either logic or numerical values thus in matrix logic and higher algebra there is a coming together of the two horns or our formalist dilemma that became split off from each together with the

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1. Matrix Logic August Stearn page 207

arising of function and agent perspectives. This synthesis comes back together with the arising of the concept of the social machine.

Figure 42:



## 19. Social Machines and Computational Sociology

Although our presentation of stages five through seven have been sketchy we are now in a position to take a global view of what the definition of this final progression of stages has allowed us to achieve. Here we are concerned with opening up new vistas not with showing all the results that might flow from the exploration of these vistas. We have outlined a radically different way of looking at general systems theory that puts it in a computational perspective. Now we have defined some very definite levels of complexity beyond general systems theory which are associated with specialized kinds of systems. The first of these is the dissipative system or what has been called here the openly closed system. In such a system there is either disorder from everywhere or order flowing in from nowhere. This appearance of nowhere alerts us that there are unseen causes at work in such a system that cannot be reduced to any mechanism. So the dissipative system is the first ultra-mechanical system. Its main features is the production of a dynamic boundary and the production of order within that order that causes catastrophic disorder in the environment around it in order to compensate and conserve entropy. Next we move to the Autopoietic system -- that is to say the living/cognitive system which is operationally closed. This system is a perpetual motion machine realized in finite space. Its closure results from the joining of two dissipative waterfalls and thus two orders from nowhere into a single structure like an Escher waterfall. The dual boundaries combine to give the closure of a torus but within a dynamic barrier. This is to say that closure manifest through time. The operation of producing closure is called the process of self-organization. This occurs because it is not just that order comes in from nowhere but that order from nowhere is itself ordered. This meta-ordering from nowhere is what we call self organization. It allows order to be directed at the self by the self. However, such a system is not reflexive. In order to achieve reflexivity we need to double the system again so we can have double closure. Double closure is in fact heterodynamic instead of homeostatic. It is able to see its own closure and react to it. It is social in the sense that this can only occur if one autonomous individual can look at another and reflect it back to itself. When every individual can do this then we have a reflexive autopoietic system. G.H. Mead calls this taking the role of the other. Symbolic interactionism has described this sort of social behavior very well for a long time. What has been lacking is the computational perspective which we will now introduce.

We posit that the turing machine which seems to be the last word in expressing the characteristics of computation is identical with the threshold of illusory continuity.

But we can imagine various operations on turing machines that allow us to build up a picture of what goes beyond the level of defining computation. The first point is that there are turing machines that can code themselves onto their tapes. This operation changes the two dimensional table of the state machine into a one dimensional string of symbols. This transformation from two to one dimensions and back is equivalent to the dissipative system. There is though this operation the possibility that a turing machine could turn itself into its dual by reading its image backward. Thus a left handed turing machine could be turned into a right handed turing machine. The dynamic of the transformation from a one dimensional string to a table and back to a string then back to the enantiomorphic table is a similar operation to setting up of the dynamic boundary of the dissipative system. Think of the tape as the environment and the turing machine as the dissipative system. The turing machine takes a blank tape and turns it into a complex pattern introducing entropy into the tape. Perhaps as its last act it blanks the table of the turing machine itself except for the part that reads the tape back. Now the tape has been disordered and the turing machine has been ordered. Then the process is reversed as the turing machine is read back but backwards it produces the opposite turing machine for which the tape now looks left handed instead of right handed. It transfers its code back into the turing machine table reconstituting the enantiomorph of the turing machine from the tape. The last action is to blank the tape except for the start symbol. Thus entropy has poured back into the turing machine from the tape that is now ordered. This ability to produce enantiomorphic transformation reminds us of the four dimensional rotation between the complex numbers and the real numbers. Here the tape reminds us of the real numbers whereas the complex numbers is equivalent to the new dimension of the table within the turing machine. The transfer of the information back and forth between the tape and the turing machine is like the twisted boundary of the dissipative system in its dynamics. Order from nowhere is the coding scheme that is arbitrary but allows the structure of the turing machine to be preserved in the one dimensional form.

Now when we consider the universal turing machine -- that is a turing machine structure that can imitate any specific turing machine -- we move to the next level of generality. A universal turing machine makes it possible to read any turing machine from a tape and constitute that turing machine. The universal turing machine is a doubling of the turing machine structure. It is a turing machine which reads other turing machines from tape and executes them. This doubling of the turing machine structure is equivalent to the autopoietic system. It is organizing itself by reading a specific turing machine structure from tape and executing it then

disengaging that one and doing the same thing over with another turing machine from the tape. Here the generality of the Universal turing machine gives a second order ordering which is like an operating system for executing turing machine programs. It is closed in that it will support all turing machines but not other kinds of machines. The network of executable turing machines form the set of nodes. If we consider how a Universal turing machine would write itself to disk we and read back its dual we see that the Universal turing machine doubles the normal turing machine that does the same thing. The Universal turing machine is a virtual machine on which turing machines execute but it itself is a turing machine that can preform the same enantiomorphic operation as other turing machines but its doing so is twice as complex in that it must write not only itself but all other turing machines to tape and then like we might reboot with a different operating system it must read itself back from tape and then read a specific turing machine back form tape to run in the enantiomorphic turing machine operating environment. So we posit that the Universal Turing machine is at the same level of complexity as the autopoietic system. The difference is that we see the autopoietic system as organizing itself. This is to say that the suite of programs on the tape is such that it is identical with the operation system of the Universal turing machine itself. The reading the programs from tape in a specific order is the same action as organizing itself as a universal turing machine. Thus the autopoietic system is a special case of a universal turing machine where the turing machines it reads from tape are identical with the universal turing machine itself so that it is organizing itself through the execution of a set of turing nodes. It is closed in a second sense of only executing programs that make up itself and no other programs. It is this special case of identity between the suite of programs and the universal turing machine that satisfies the conditions of autopoiesis. It is an image of transcendence attempting to ground itself. It is the embodiment of paradox. Like four dimensional rotations it only seems like a paradox because it seemingly violates three dimensional rules.

Finally there is the case of interacting universal turing machines that are exchanging programs that represent nodes of themselves or other symbolic streams over a mutually held tape. This case brings us to the level of the social machine and sociological computation. Such a system allows the two social machines to have images of the other within themselves. They communicate via a protocol which is really a meta-state machine encompassing both social machines. What makes them social machines is the fact that they are at once separate and at the same time part of a meta-system of turing machines who all have an image of each other and perhaps the whole of which they form a part. The social machine is social precisely because

it is part of a meta-machine of individuals who all have the same internal image of how they appear to the others and they base their actions toward the others on that image. In the minimal social machine this is accomplished because there is a protocol or higher level state machine that embraces all the social machines in the society of social machines. These social machines can read each others programs and thus have an image of how the others will react and then given this context can change their own actions to anticipate what the others would do if it did some action.

Computational Sociology is more fundamental than distributed artificial intelligence because all the techniques of artificial intelligence are paradoxes in the software layer. Thus we must first define the software layer independently of the artificial intelligence capabilities. That software layer is described by the set of minimal methods which are partial machines. We add Artificial Intelligence by taking advantage of paradoxes in the software layer to produce opaque seemingly intelligent behavior. But this is done in the context of the layer of software methods from which all paradox have been excluded. In fact these minimal methods allow us to analyze the real-time system of cooperative social machines from every possible point of view. Up to the point where social machines occur there is really only one computational machine. Social machines is the point at which multiple interacting machines arise sharing the same tapes as communicational channels. This is the point where these machines become independent agents idealized as Actors given Agha's model. This is a threshold where endless variety of distributed and parallel computational structures are produced. The minimal social machine sits right at the point of the production of distributed and parallel structures. It is defined as the minimum structure that will allow two universal turing machines to talk to each other. It can also be seen as the point where instead of a single turing machine reads itself from tape and then back on to tape the enantiomorphic images of the same universal turing machine are both instantiated at the same time. This is a fundamental point of bifurcation where the mirroring is embodied directly. It is but a step till the two images begin to talk to each other and this minimal difference of enantiomorphism becomes two complimentary or different universal turing machines participating in the same computational society where society is given the same definition as in Symbolic Interactionism which is basically done through everyone taking the role of the other at which point specifically social emergent structures appear.

When we add to the minimal social machine the capacity to use hyper-matrix logic

and hyper-hyper-complex algebras as a means of defining operations then we get a very robust computational environment. It is the role of computational sociology to explore this rich computational environment that stands in the breach between the single universal turing machine and all distributed turing systems that cooperate with each other to produce emergent effects that no one system can produce on its own. Computational sociology stands between software and artificial intelligence, between Von Neuman architecture and distributed computational architectures, between general systems theory and software engineering. It is the pivotal discipline around which all disciplines revolve because it provides the fundamental model of the minimal independent intentional agent as a basically social creature, i.e. who can cooperate with others and produce higher order harmonious structures. What is fascinating is that many real-time systems already assume this level of cooperation and all we are saying is that we can produce artifacts that display sociality because we are inherently social creatures. In fact the social aspect of our being is the most fundamental aspect of who we are. We cannot be individuals in the Western sense unless we arise out of society. We are constituted out of the social milieu and are nothing -- mere wolf children without that primary social matrix -- we can call it a matrix because it was fundamentally a spacetime/timespace environment where we learned to process symbols at a distance and through them learned to act at a distance on others and cooperate with them by having an internal image of how they saw us which we reacted to in anticipation. The social level is the most fundamental. By producing an image of minimal social machines we are not saying that all social behavior can be reduced to minimal social machines. We are in fact saying that our computational simulation systems in container spacetime must be enhanced to account for very specialized systems such as the dissipative, autopoietic and reflexive systems. These specialized systems exist at very precise levels of complexity and can be emulated by computational structures. If we want to simulate symbolic interaction within a society there is a minimal level of complexity at which we must poise our simulations. This does not mean there are not more complex structures but it means that any symbolic interacting system can be simulated by some combination of minimal social machines. However, such a reduction may destroy emergent properties within the social level. This is because for the social level computation is not the correct measure of all things any longer. At the dissipative level the criteria moved from computation to the dynamic entropy exchange which must define information in terms of ordered data. Data exists along with events at the level of illusory continuity. Then from information we move to the knowledge level. Knowledge gives us a deeper understanding of information. It adds a basis of

understanding to the information. Knowledge appears at the autopoietic system level because such a system is inherently cognitive. At the social level we get wisdom where in addition to a basis of understanding we add experience. All wisdom is inherently social in character. Only a fragment of a social system can display wisdom because only a fragment of a social system has a history. Autopoietic systems have no history. To it all events at the surface are perturbations. The Social system has an active heterodynamic relation to its past and future. It is projecting its history as a rewriting of the past based on the appearance of emergent events. Thus the social system is the spawning ground for wisdom which synthesizes knowledge, information, and data.

## 20. Artificial Intersubjective Simulation

Ben Goertzel has the concept of simulating artificial societies as shared belief systems. I would turn this idea upside down and say that the social level of shared beliefs is more fundamental than the individual belief systems. Thus the social level must be seen as a level that exists as a constraint on the individual level rather than something that arises just out of the interaction between individuals. The individuals emerge out of the social milieu that acts as a constraint on the individuals beliefs and actions. The shared belief comes before the individually held belief. We are all initially lost in the They. Dasein is inherently social in nature and may be made up of more than one person as in Japan where traditionally the unit of society was the *Ie* instead of the individual or in China where the individual was the clan. You tell this by looking at who is killed if something very bad happens.

One of the objects of computational sociology is to produce a simulation of social processes. Such a simulation would be based on Goertzel's model of chaotic processes but would be at the level of complexity presented here for the definition of minimal social machines. Such machines must be capable of computing Cayley algebras and Hyper-Matrix Logic operations. The point of this is that Hyper-Matrix Logic operations are inherently structural formal at once. It is the only system I know of that is both completely formal and completely structural at the same time. When we move to the Hyper-Matrix Logic level the forbidden operations of Matrix Logic proper do not prove to be a hindrance any longer. We can change the basis of our computations at will to get around the forbidden operations so that perfect rotations within the formal-structural system may be accomplished. Now having a logic by which we test functions this must be complemented by an algebra. It is the



algebra that allows us to manipulate autonomy by counting. That algebra must in this case support hyper-hyper-complex operations which give us not just closed loops (Klienian Bottles) in the fourth dimension but self reflexive closed loops. This is to say that the Klienian bottle of the reflexive autopoietic system can turn itself inside out and see itself from the inside and outside at the same time.

Knowing the right level of complexity to poise the reflexive autopoietic system simulator at and that it participates in both Cayley algebra and Hyper-Matrix Logic as well as the fact it is a series of Universal Turing machines that are talking to each other across their tapes adds a lot more structure to the model that Goertzel has set out for the way chaotic processes interact. We would also like such a system to exemplify all the minimal methods as the means of imposing the order on the entire social milieu. We see now that design methods are the means by which the social machines acting as a society can impose order and unity on themselves. They do that through invoking partial machines. Thus we see here directly the relation of the socius to the partial machines which bounds the stage of the arrival of the Turing machine from two directions just as Deleuze and Guattari predicted. And of course we would want to be able to use the paradoxes in the layer of minimal methods to give the social machines intelligence. In fact we say that living or autopoietically closed machines are the object of artificial life. Artificial intelligence is a concomitant at the same level as artificial life. Artificial sociality exists at the next level up from the knowledge level and at that level we can begin talking about artificial wisdom which blends knowledge with experience. But the root of such wisdom is the understanding of how to make non-nihilistic distinctions and such distinctions are ultimately founded on the ability to recognize the genuinely emergent event. Artificial wisdom is receptivity and proactive involvement in searching for the emergent event. We might posit that if we take all the artificial intelligent techniques and use them in all their permutations the limit which they approach is artificial wisdom. All the different kinds of machine learning when used together in every possible combination also approaches this limit. Artificial wisdom is the ability of a machine to deal with genuine emergent events which means the totally unexpected that causes all your paradigms, epistemes, or interpretations of Being to shift. The minimal social machine simulator strives to produce not just emergent events but wise responses to such events within the simulation. We take into account that emergent events will occur but we strive to have our simulated social systems react wisely to these emergent events. This is the Palmer test of a simulation of a social machine. Is it impossible to distinguish the wisdom of a social machine's reaction to genuine emergent events from that of a

human or some other social creature. Each social species makes its own test.

## **21. Fifth and Sixth Dimensional Rings**

We have posited that the pentahedron of four dimensional space is the minimal model of the autopoietic ring. We will not posit that the sextahedron of five dimensional space is the minimal model of the social or reflexive autopoietic system. We note that at this level in Pascal's triangle if you add up all the elements you get 64 just as 32 was the ultimate the number of qualities that appeared at in the pentahedron. This is of course the number of words in the language of DNA. It is the number of Hexagrams in the I Ching. It is the amount of information embedded in the Chess board and each side in the chess pieces. 64 is the first number that allows transformation from three dimensional configuration to a two dimensional configuration and back again where one knows the exact mapping between all the positions of elements in both dimensions. Thus the chess pieces of one side as a three dimensional thing when considered as merely information maps directly into the board. Because both sides do this that is the basis for the conflict in chess. Chess is an artifact poised exactly on the threshold of complexity where the social comes into existence. This opens another line of inquiry as to whether there are other cultural artifacts exactly on this threshold of complexity. We have already mentioned that it is embedded within us as DNA and one of the basic books of Chinese society was poised exactly on this threshold of complexity. The sextahedron sets on this boundary and as we saw earlier it mediates between the six simples and the six bodies; between the six Temporal Gestalts Causa Sui and the six minimal method embodiments. In the I Ching we see beyond reversibility and substitution of lines there are twenty sources which equate to the twenty surfaces of interaction between heaven and earth. Thus at the center of the social is a basic dynamic interaction between heaven in the form of unseen causes (Hsing) and yin earthly receptivities (elements) which produce twenty fundamental kinds of interaction that we can say correspond to the Mayan Day Names. These fundamental interactions are the basis of the distinguishing of the genuine emergent event. Every genuine emergent event must be the after birth of an unseen cause that impacts yin or earthly things. Knowing the twenty possible interactions allows one to recognize the spreading streams of causation from that unseen event. There should be four such independent rays of causation emanating from such a causal event that are orthogonal to each other. These are of course chains of secondary causes. The I Ching perfectly exemplifies the structure of this causation. It is based on the fact that between any two hexagrams there is a third intermediate hexagram

which serves as a bridge and wall separating yet connecting the two. So every hexagram serves in this intermediary capacity between two other hexagrams. From this we see that the I Ching perfectly exemplifies the situation where the container IS the contained and vice versa. This sameness between the container and the contained makes the I Ching a perfect representation of a form that exists within the web of interpenetration without disturbing that web. We have already said that the social juts out into emptiness and must have interpenetration as its positive attribute of highest harmony. So we see that the sexagonal five dimensional form has this same structure as its basis. Just as the pentahedron models the autopoietic system so the sextahedron is the perfect model of the inner structure of the social system. All the states of the I Ching are states that the social cohort can attain. Here we are talking about as a minimal structure. This is because the four dimensional autopoietic structure needs another dimension in order to become fully reflexive. In that higher dimension the static relations between heaven (the cognitive) and earth (the living) become a dynamic in which the six Temporal Gestalts Causa Sui interact with the six embodiments of the minimal methods via the twenty action-reaction surfaces of response. If the hexagrams are the interference pattern between the warp and woof of fate then we can see that the equivalent of the torus are the six groups of seventy eight that correspond to the five groups of twenty at the level of the pentahedron. Seventy eight plus three is eighty one, the number of operators in Matrix Logic. The three missing are the pure unbroken, broken once, and broken twice of the Tai Hsuan Ching. Thus the social level merges the I Ching and the Tai Hsuan Ching structures in a single over all structure. What the shape of the Klienian bottle in the fifth dimension is unclear. However, we can see that it would be given a new dimension to rotate involute and thus to achieve some dynamism beyond the movement of shadows in the third dimension. The fifth dimension brings dynamism to the structure of the minimal autopoietic ring. It is only the beginning of infinite levels of interpenetration. But it is a particular level of interpenetrating complexity at which the minimal social machine is poised. The fact that the tetrahedron of viewpoints has this inner structure gives more credence to our assertion that sociality is built into spacetime/timespace metric structures from the beginning. It is we who separate sociality from spacetime. Thus our primary assertion that space is social, that even the most a social aspect, the fundamental category that is the root of all others is internally social in nature because it demands a sextahedral lattice to resolve the interaction between the six Temporal Gestalts Causa Sui and the six embodiments of the minimal methods.

## 22. Worlds within worlds

One of the things we notice if we look at Pascal's triangle and meditate on the fact that it is really an n-dimensional mandalla of all the simplest concave polytopes of every space is that at the sextahedron in fifth dimensional space we are must on the edge of an infinitely deep abyss of interpenetration. I believe this infinite series of simplexes within simplexes is the harmonious heart of the interpenetration within society. We are lodged at the level of the sextahedron because that is the minimal level at which the social appears. But any level above that may be manifest within the social realm. If we have 5.5 billion people on earth and they can be seen to form a social milieu then somewhere up the ladder of Pascal's triangle there will be a simplex with 5.5 billion or so nodes that will embody the interpenetrating relations between all the people on earth. But the sextahedron is special because it is the first simplex at a level of complexity that allows the expression of sociality. The pentahedron expresses the autopoietic and the tetrahedron expresses the simplest figure that can appear in real space. The level of the dissipative system is marked by the realization that the tetrahedron is not the only way of looking at a the minimal system. We can see it as mobius strip, torus and knot as well. The transformation between these geometrical interpretations of the tetrahedron is similar to the production of the dissipative system. Those transformations carry on up the ladder of the pentahedron and the sextahedron and perhaps beyond. We are not interested in the beyond except to note that it is there. We are interested in minimal formulations and the sextahedron is already plenty complicated for the lowest level at which a fully social system to manifest.

Every society is made up of individuals that interlock in different degrees of harmony but the highest harmony is interpenetration. The society projects the world which the individual inhabits. It is a social construction. This social construction of worlds leads us to study ontology in order to understand the nature of worlds. But we must go beyond that and understand the minimal social machine and its structure. We have taken a step in this paper of defining the structure of the minimal social machine by isolating the level of complexity at which it exists. If we combine this with Goertzel's model of self-generating component system and Arbib's concept of a self-functoring machine category, then I believe we have a sound basis for beginning to model the dissipative, autopoietic, reflexive system. It has a specific scale in terms of complexity at which its minimal formulation sits. That scale is precisely related to other scales though our series of stages. In that series we have built a new way of looking at general systems theory in terms of

methodological distinctions and we have extended it step by step through hyper algebras and hyper logics to formulate the social. But let us state that this formulation is heuristic because the social is the most fundamental level of the structure and we have only formulated the stages to allow those who do not share that assumption of the fundamentalness of the social to understand how we get to the threshold of the minimal social system. Once there we do not pull of the ladder but reverse its direction and state unequivocally that first there was the social and everything at the other stages emanated from it through the painful process of individuation peculiar to Western culture.

If we were to follow up this reversal we would say that the twenty sources or response surfaces are fundamental and that around them the six Temporal Gestalts *causa sui* and the six minimal system embodiments take form. These show the interaction between viewpoints and the matrix. This interaction occurs within the context of the autopoietic ring represented by the pentahedron. The autopoietic ring is a specialization of the entropic twist of the openly closed (or dissipative) system. And finally this all takes place in spacetime/timespace of illusory continuity upon which we can have four viewpoints and in which there are four basic embodiments. We can view the systems that appear in this arena in terms of any level of methodological distinction until we get back to no-order and no-distance which is the furthest we can go in divesting ourselves of the tools by which to study dynamic systems.

I will posit further that it is in the twenty response surfaces that the tendencies that we have studied show up. We have said that it is the tendencies that are the explicit categorical foundation of the social. Tendencies are just the opposite of receptivities. Tendencies are incipient movement. Receptivities are passive incipient acceptance of movement. Thus what occurs at the response surface is very interesting. We know that each surface is the connection between a Temporal Gestalt *Causa Sui* and a minimal system embodiment. But that connection is not direct it is instead mediated by fifteen nodes on either side that mediate the relation between the two pairs of six. The temporal gestalts *causa sui* are the hyper cycle of jump starting points that allow the society to be ecstatic or heterodynamic. Through the mediated relation to the minimal method embodiments they connect to the inner workings of the turing machine. They are the ghost in the machine so to speak. But what are the fifteen other nodes that mediate this relationship. Well if the Temporal gestalt *causa sui* is like the simple and the embodiments are like the body then the two sets of fifteen other nodes must be analogous to the skeleton and the manifold

or skin of the thing. They are a differentiation in one case and a lack of differentiation in the other. We can relate them to the thirty two pentagrams from which we would take away the all yin and the all yang ones to give thirty. This thirty is divided into two sections of fifteen each that represents the manifold and the skeleton. In this way we see there is an inner and deep relation between the four kinds of thing looked at from the point of view of slicing and distortion ways of worldmaking and the order and distance container based upon the other ways of world making excluding weighting. We can also see that if weighting is seen to occur in the twenty response surfaces then all five ways of worldmaking participate intimately in this structure. It is a structure that digs beneath the ontological foundations of ideation. It is a structure that is shown to be deeply based in the social nature of all things which derive from their appearance in our world which we project as the unfolding of the inherently social Thing. By treating what appeared as basically a-social we have discovered a social basis for all computational structures that can exhibit distributed or parallel execution. So we have established the credibility of the reflexive system as the end of a sequence of specializations of general systems theory that included the dissipative and autopoietic systems. And since this end point is the minimal expression of the kind of system that projects the world we can say that by turning our ladder of stages upside down we have encompassed all the major ways of worldmaking identified by Goodman and built a general theory of worlds that encompasses general systems theory and all the specialized systems giving a formal basis for social phenomenology. What is left is for us to go back into the roots of our own worldview and show the genesis of that social system that has gained world dominance that needed to construct the world such that constantly new worlds are always emerging. This task has been undertaken in the authors book on the Fragmentation of Being and the Path Beyond the Void. But given the argument in this paper we will consider the discipline of computational sociology based on the foundation of social phenomenology well founded. The difference is that it is in this case founded on the abyss of emptiness of an infinite regress of interpenetration simplex structures. The regress of Pascal's triangle is the crystalline structure within the geode that encircles an empty center from which all meaning, discrimination, recognition, and part/whole realization flows as a continuous upwelling stream if it is not repressed. If it is repressed by building the wall of illusory continuity to cut off the emptiness than Deleuze and Guattari record the consequences as Oedipus, the embodiment of ideation, tragically stands his ground ignoring the signs of his destruction.

## 23. Reprise: Moving Through the Stages Yet Again

Autopoiesis is the theory of living systems. An autopoietic system is self-organizing, literally self-producing. It is necessary to understand the taxonomy of all possible systems which includes the autopoietic system and its refinement into the reflexive autopoietic system that appears as the epitome of sociality. Unless we have a means of classifying all possible systems, which includes the classes of the living-cognitive and the reflexive autopoietic systems, then it is difficult to understand how autopoietic systems fit into the category of systems constructed by general systems theory. General systems theory treats systems as objects. We have realized that systems must be treated not as objects, but as gestalts, i.e. showing and hiding processes. We have identified autopoietic systems as a special class in which the self-grounding of transcendence of Being is exemplified. This is a lost possibility which was outlined by Plato in his *Laws*. It occurs at the point just before the collapse of Primordial Being into the artificial unity of conceptual Being. These mechanical systems appear to be analogous to life and intelligence in their emergent qualities. This is based on the fact that, like the Escher waterfall, they are neverending perpetual motion machines. We have gone on to show that there is a special class of autopoietic systems which are reflexive that embody sociality, and it is the reflexive autopoietic system that is the fundamental embodiment of the social, of the city in its primordial formation. As such, it has the form of emergence itself, and thus it does not suffer from emergent events. It has a meta-stability within the world because it is the source of the world, and when harnessed, becomes the foundation of the Uni-verse. But these postulated special kinds of systems, which are more than gestalts but embody the structure of meta-systems and worlds, need to be differentiated from the kind of system that is a gestalt and from objects contained in systems or the primitives that make up objects. We need a systems theory that allows us to distinguish clearly between these different kinds of systems and those elements that do not have the attribute of systems but appear within systems. Systems are the expression of wholeness that the Indo-European tradition continually strives after once it has shattered the wholeness of natural complexes. To understand the expression of the Indo-European worldview in our own time, we need to have a clear notion of the different kinds of systems and the meta-level structures that appear on the basis of systems. This means we need to establish the foundations of autopoietic systems theory which is a specialization of general systems theory that deals with the specialized systems and meta-systems that appear as possibilities within our worldview and are associated with life, intelligence, society and all the emergent levels that are the expression of our own nature as

Indo-European humans who have broken and tamed the world bending it to our own view of things. Understanding how these systems appear in our world, is to gain some measure of self-understanding. Self-understanding is the obverse of self-organization which can only appear at the level of the manifestation of the reflexive autopoietic system.

Let us begin with B. Fuller's definition of the minimal system. Here we shall only deal with minimal systems because we are interested in the simplest possible manifestations of the phenomena we study in autopoietic systems theory. Fuller suggests that a minimal system has at least four elements overlapping their duration in their spacetime manifestation. We call these elements eventities which signify that they are both objects and events within the primary process of manifestation. The four overlapping eventities may be viewed in many different ways, and our autopoietic systems theory is a taxonomy of the ways in which they may be viewed.

A point made by Penrose in his book on spinors is that  $4\pi$  is the minimal movement that can be thought of as being stationary in spacetime. Any movement less than  $4\pi$ , or standing still, can be seen as a movement. But a  $4\pi$  movement can be seen as the same as not moving from all inertial reference frames. This means that the minimal system is actually a reification of points that are fixed in four dimensional spacetime. It means that a minimal system is the simplest thing that can look the same in all inertial reference frames by all observers. The minimal system is intrinsically intersubjective by the fact that it participates in all possible frames of reference. So when we look into the minimal system, we are looking into the social or the intersubjective in its simplest manifestation within the Uni-verse.

### 23.1. Stage One

The very first way that the relativistically stationary points may be viewed is as isolated independent units. Charles S. Peirce would call these Firsts. Firsts are anything that can stand alone without relation to other things. Thus, the first way we can view the eventities of the minimal system is as having no real relation to each other. We elect to not relate the eventities that make up the pieces of the minimal system. As such, they are pure data or pure events. We might call them infotons. They do not yet form a pattern. In fact, we are suppressing their patterning and treating them as independent isolated units. In essence, they are each minimal systems themselves, or else they could not be seen. Only minimal systems manifest so that anything that is less than a minimal system is an abstraction from or a dissection of a minimal system. But if we refuse to see the relation between the



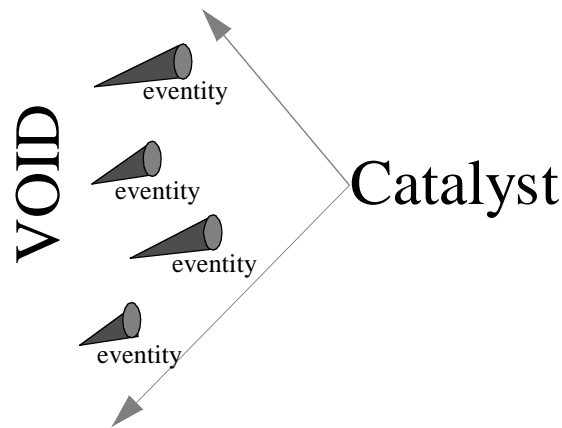
eventities of the minimal system, then we are treating them as a plenum of pure data or pure events. In systems engineering, it is requirements that have this nature. Each requirement is an aphorism that expresses a need or desire of the customer. Ideally, all requirements are perfectly orthogonal. Thus, requirements appear as Firsts -- independent isolated units. But in the case of requirements, they are expressed as linguistic statements. Minimal systems need not be made up of linguistic statements. A good example is Wittgenstein's book *Zettel*, which is basically a box of clipped statements from other manuscripts. *Zettel* presents us with a universe of statements which are independent of each other, floating together like a cloud of aphorisms. They are the best indication of the insanity of Wittgenstein. In fact, it is in the Firsts, the isolated requirements that express desire, that we see the schizophrenic foundation of society manifest that Deleuze and Guattari speak of in *Anti-oedipus*. Requirements express desire and need. They are the fragments of desiring machines -- not yet machines, not yet systems or networks of desiring machines, only the effervescing expressions of desires arising out of the void. Firsts appear directly out of the void. They manifest, popping out of nowhere as an expression of desire or need. We see them as a cloud of particles acting under the statistical laws of thermodynamics like a perfect gas. They spread to fill the whole of space. They are everywhere we look. Sensations, sensory data, virtual particles or infotons are manifesting everywhere, pouring out of the void, producing a pure plenum of desire which fills the world.

We can take a point of view on phenomena that sees the outpouring of Firsts from the void. That viewpoint has been called the Catalyst. It is called the Catalyst because it does not itself interact with the Firsts, but serves to cause them to change into the primitive, object, system, meta-system, world, etc. by successive transformations. We can see the relation of the Catalyst viewpoint to the eventities of the minimal system considered as Firsts in terms Husserl's concept of the "intentional morphe" organizing the "hyle" of sensation. This is the idealist (Kantian) view that transcendental subjectivity organizes the noumena into phenomenal objects. We must conceive that the eventities are pure content which is formed by the will to power of the transcendental subject in an act of domination. Instead, we take a different view which concedes that there is a fundamental viewpoint on minimal systems that is inherently disordered. That is to say, it has access directly to the schizophrenic undercurrent upon which all the primitives, objects, systems, etc. float. It is the writhing of spacetime itself at the micro-level where virtual particles are created and destroyed within the limit set by Plank's constant. But this appears only as schizophrenic to the repressive regime. The

Catalyst sees it as an outpouring of the cornucopia of variety. Human beings are variety producers. This variety manifests, and upwells from the void. It is the Catalyst viewpoint that sees this upwelling. It is the positive side of the essence of manifestation. As Deleuze and Guattari say, the unconscious, or body without organs, may have various intensities. Its zero intensity is the practico-inert or matter. Substance is the hiding place of the essence of manifestation. It is the source of all interference and resistance within the world. But this pure immanence may also appear at the other extreme of its intensity as the cornucopia of the upwelling from the void of a myriad varieties of partialities. When I say I am partial to something, I express a desire. This is the upwelling of independent isolated desires which is the substrata of sensation. As sensation draws us in to notice it, we then express the obverse of our desire flowing out toward the world. The Catalyst viewpoint sees this upwelling of desires and all the partialities which we interpret as pure data and pure events. They flood in on us and overwhelm us, and it is through them that we get some intimation of the overwhelming of primary process, i.e. manifestation. The Catalyst viewpoint will eventually become one of a set of viewpoints on existence, and in relation to those other viewpoints will have its related set of minimal methods. But at this stage, the Catalyst viewpoint has no minimal methods; it is merely the witnessing of the upwelling of Firsts from the void. This viewpoint has no basis for thinking about the firsts that are appearing. Because logic has not yet appeared, there is nothing on the basis of which to produce relations. This viewpoint can only contemplate or witness what appears to it. It is purely reflective, not in the sense of reflexive in which thought thinks about itself, but in the sense of reflecting, like a mirror, what appears before it. In reflecting the phenomena that appear, the Catalyst has an effect on that which appears. It is not a transcendental subject, a metaphysical illusory continuity, but instead is that which, by its presence, causes a transformation in which it does not participate within the realm of the sensations themselves. In fact, we eventually realize that the unity of the Catalyst is the nihilistic opposite of the ignored relations between eventities of the minimal system, and that the forcing of the eventities to become minimal systems is a repression that hides the minimal system by distorting it into four minimal systems and the unity of the Catalyst viewpoint. In fact, when we return to viewing the minimal system without repressing its inner unity, we see that it is unnecessary to produce the nihilistic opposites of the pure sensation and the perceiver of that pure sensation. The nihilistic opposites are really repressing the unity of the natural complex of the minimal system. We see that the Catalyst viewpoint is an artificial construct that appears because of the repression which turns the eventities of the minimal system into pure events and pure data -- infotons.

But then, all the viewpoints on the minimal system are artificial constructs, and so this should not deter us from seeing their importance. The production of perspectivalization is the action of active nihilism. The Catalyst viewpoint is only one of a set of fundamental viewpoints we will discover in our articulation of the fundamental taxonomy of autopoietic systems theory.

Figure 43:



### 23.2. Stage Two

When we stop repressing relation in the natural complex of the minimal system of eventities, then the first kind of ordering that appears is partial ordering. Partial ordering means that the converse of a posited relation may not hold. Thus, we see the eventities of the minimal system in terms of a series of one-way relations where any one relation does not imply any other relation. It is a web constructed on a case-by-case basis between the set of eventities. This web is an expression of the will to power. It expresses dominance of dualism in which one element lords over another (women, barbarians, slaves, children, etc.), establishing one-way power relations. Partial ordering expresses calculus of domination under dualism. Dualism expresses the transcendental movement which is summarized by Conceptual Being. Here in Husserl's terms, we see the first appearance of noesis and noema as combinations of formative powers and content. Noesis is where formative aspects are emphasized over content as in ideation, while noema are where content aspects are emphasized as in perception. At this stage, we recognize that the separation of subject and object as pure sensation is a false dichotomy, and that these two are always intertwined. Here we see the single Catalyst viewpoint split into two very different viewpoints. There is the viewpoint which is associated with intention which is called functional. And on the other hand, there is the

viewpoint which is associated with autonomy which is called the agent. These two viewpoints see the eventities of the minimal system in two different lights. The Functional viewpoint sees the eventities in terms of the transformative processes they embody. The Agent viewpoint sees them in terms of something that may be indicated as having independent existence. It has already been made clear that the Functional viewpoint expresses the ready-to-hand modality and grasping, whereas the Agent viewpoint expresses the present-at-hand and pointing. Both of these are differentiable meta-levels of Being. They both arise here together at the second stage of our systems theory. They may be seen as the splitting of the Catalyst viewpoint which witnesses pure primary process (manifestation). For the Catalyst viewpoint, conceptual Being is an indivisible whole. With the advent of these two additional viewpoints, the possibility of secondary process appears. Secondary process is intentional and is carried out by existent eventities. Here the difference between essence and existence becomes clear. The functional is related to the essence of the eventity. Agency is related to the existence of the eventity. To the extent that the eventity is purely present, it can be singled out as an Agent. To the extent that the eventity is a transformative process, it can be singled out as a function. Its functionality tends to show how it is related to other eventities. Its agency tends to emphasize its independence and isolatability from other eventities.

The introduction of partial ordering also allows us to consider the minimal system as a lattice. A lattice helps us express the nature of all the partial ordering one-way relations. Thus, we can see that a tetrahedron, the geometrical representation of the minimal system, is primarily a lattice structure. The tetrahedron is a lattice with a structure of 1-4-6-4-1 as it appears in Pascal's triangle. The partial ordering relations taken together can be represented as a lattice. But because partial ordering and lattice structure work together, it is possible to produce a hierarchy out of the eventities based on both of these structures. The hierarchy is the primary expression of dominance as a static structure. In the lattice, we work through all the possible relations between the eventities. All the possible relations gives us a lattice structure that organizes the eventities of the minimal system in total. But the hierarchy is not reducible to just a set of binary relations. Thus, we encounter here what C. S. Peirce calls Thirds. Thirds are when significance is generated as a by-product from sets of dual relations. It is of interest that we jump here directly from Firsts at stage one to Thirds at stage two. The hierarchy has some information which is not captured by a mere list of all its dualistic relations. The hierarchy is a pattern. The pattern has significance. That supplement of significance, or relevance, cannot be captured by the set of binary relations. There is always a third

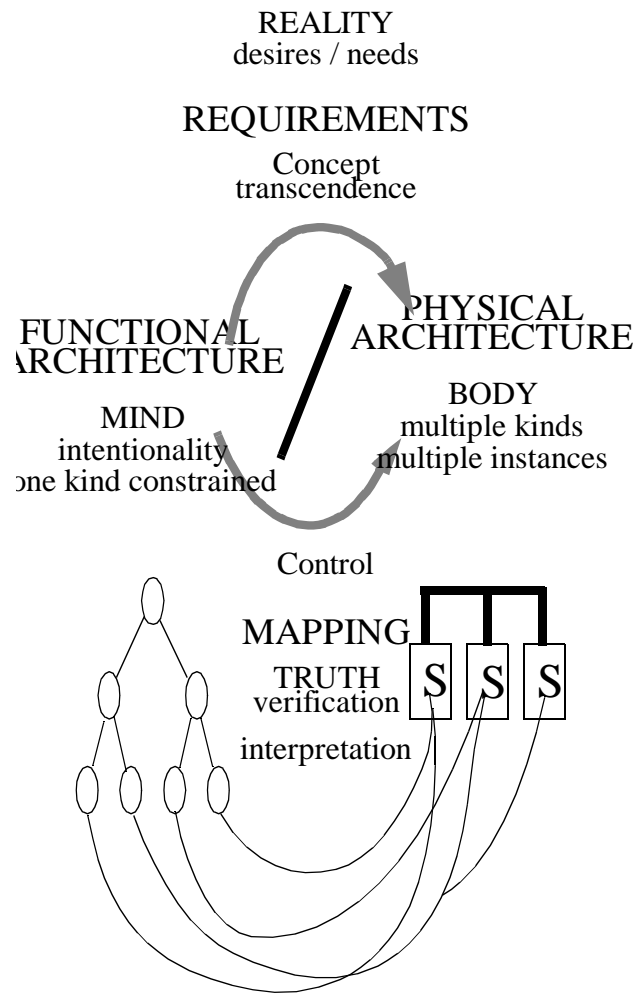
dimension which is generated when the relation is made. Peirce makes this point, and we re-emphasize it here. When the pieces as Firsts are arranged into a pattern, some significance is produced which goes beyond the information given. But what we realize is that this is the entry point of the third thing. We realize that as soon as the relation as a partial ordering appears, we have logic and the syllogism. Here we have entered into the realm of the flaw which connects everything together on the surface with a web of outward relations that depend on secondary causation. The upsurge from the void is covered over by the web of connections produced by ideation. The Third is the action of ideation which connects the eventities of the minimal system. The Third is the illusory continuity being actively maintained. As soon as any connection is made, this illusory continuity manifests, and we see it as the ability to discriminate sources of secondary process within the primary process. The locus of secondary process is located by looking for autonomy and transformation, i.e. agency and functionality. We see the eventities of the minimal system as parts, even though we do not see the whole yet. We see them as parts as the action of ideation discriminates them in relation to each other.

In systems engineering, we see a fundamental pattern which relates the three viewpoints so far enumerated. The Catalyst viewpoint is that which isolates Requirements. The Functional viewpoint isolates the Functional architecture of the system. The Agent viewpoint isolates the physical architecture. As has been explained in an earlier essay, these are tied together with a set of mappings that express their truth. The requirements establish the connection with reality as linguistic statements are mapped to desires and states of affairs. The functional architecture stands in for the mind as the physical architecture stands in for the body in a dualism that asserts the dominance of transcendence. The hierarchy of functions are mapped to the hierarchy of agents which are, in turn, mapped to the requirements. Those requirements may be either functional, performance or physical in nature. Also, there is a mapping of functional architecture elements to hardware and software -- that is to technology or meta-technology. The interworking of the three viewpoints together gives us a picture of the will to power of transcendence. This is the advent of the Third thing as a "Third" -- a generated significance -- the production of illusory continuity by ideation. The systems engineering process embodies this in the production of designs. Production of designs is more fundamental than factory production. It is not who controls factory production that is crucial. What is crucial is who controls the means of production of designs. Engineering is the place where new product innovation occurs. Control that, and you gain the technological edge, which is what counts. The real

competition is over patents. Patents generate streams of revenue which you do not have to do any production to capture. Other people do production and license the technology from the inventor.

We are now in a position to appreciate the nature of the autopoietic system. The autopoietic system fuses autonomy and intentionality. It intentionally organizes itself as an autonomous unity. When functionality and autonomy are separate, then one has an allopoietic system which must have been produced by an autopoietic system. Autopoietic systems embody secondary process, whereas allopoietic systems embody tertiary process. The fused agent and function viewpoints are not the same as the Catalyst viewpoint. The difference is between the inside and outside of the autopoietic system. Whatever is outside the autopoietic system is seen as an onslaught of perturbations. Thus, the Catalyst viewpoint sees the arising of these perturbations and their impact on the autopoietic system. The fused functional and agent viewpoints sees the closed inside of the autopoietic system which is independent of all the perturbations by arising Firsts. The fused function and agent viewpoint views the inside of the autopoietic system as a single unbroken continuity which cannot be breached from the outside, and to which anything happening on the outside is irrelevant. The whole focus of the autopoietic system is to perfectly align the functionality of the system with its embodied autonomy. In fact, its function is to remain autonomous by imposing its functions upon its autonomous parts, rendering them a unity. As we move from stage to stage, we will see how this is accomplished. However, it is interesting that the definition of the autopoietic system is implicit in the structure of the three viewpoints which appear when the very first kind of relation between the eventities of the minimal system can be defined.

Figure 44:



The functional and the agent viewpoints are intimately involved with language. Were the Catalyst viewpoint witnesses meanings arising out of the void, these later viewpoints are directly connected with the expression and embodiment of significance as in natural language. Function expresses significance, and Agency embodies significance. Significance appears in the relation between diacritically related things. This is another way of talking about the apprehension of their functionality. But significance must be embodied through signs. The signs have their own life as icons, which in some way must have a material component that gives them independent existence and some measure of persistence, if only fleeting. So for example, words have a function within a grammar which confers and regulates their significance within language. Words also have a significance in speech as concrete embodiments of significance in a particular context. Many times, words stand in speech alone and only have meaning in relation to this

context. Speech can also be the site of the emergence of grammar and the words themselves. When the grammar and the words are mutating and evolving, we get some access to meaning beyond significance. When the function and the autonomy of the words merge and fuse, we get poetry. When the grammar and the words begin to mutate, the poetry breaks down into aphorisms which are the first expression of philosophy. Poetry looks only to its own form, whereas philosophy looks beyond the form of the poem to the world in which the poem relates. Philosophy and poetry belong together as the Same. The fusion of function and agent within the autopoietic system belong together with the Catalyst viewpoint which looks at what is beyond the autopoietic system. The ring of the autopoietic system produced by the advent of the Third floats within a cloud of Firsts that to it are merely perturbations.

### 23.3. Stage Three

When C.S. Peirce formulates the concept of the Third, which is seen by him as a fundamental category that goes beyond logic, he also posits that there is no further category needed<sup>1</sup>. B. Fuller, on the other hand, posits a further category which we may call, following Peirce's terminology beyond his usage, Fourths<sup>2</sup>. Fuller calls the category synergetics. Synergy is the interweaving of parts into a whole where each part has multiple uses within the unity of all the parts and which produces a whole greater than the sum of its parts. In systems engineering, that whole is called the system concept. In software engineering, it is the non-representable software design. It arises as a dialectical synthesis between the Functional Architecture and the Physical Architecture. It cannot be captured directly. So at this stage, there appear two kinds of ordering which are duals of each other. There is linear ordering in which any relation has an inverse. As its dual is partial ordering with distance which adds a metric to the partial ordering which says how far apart the ends of the partial ordering relation are as an additional piece of information. These dual methodological distinctions arise at the same level and are the means by which the synergetic concept of the minimal system is framed. Here the minimal system may be seen as either a set of linear relations or as a set of partial ordered relation with distance or a mixture of the two. Through this mixture, the synergetic concept, which is a wholeness greater than the sum of the eventities that make up the minimal system, is defined.

At this stage, we get objects appearing. Objects are shaped forms. They are not

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1. See Robert. W. Burch, A Peircean Reduction Thesis: The Foundations Of Topological Logic (Lubbock, TX: Texas Tech U.P., 1991)
  2. Synergetics I & II



two dimensional like hierarchies, but three dimensional. The object may be designed. It is the addition of a metric or of reversible linear relations that allow that design to be effective. Dynamic objects are machines. Machines require design where a set of parts are combined in a particular way which allows them to function. Autopoietic systems are machines that organize themselves. Autopoietic systems are four-dimensional machines that may be perpetual, unlike three-dimensional machines.

The system concept has two aspects: a selection of significant dimensions and a motif. The set of significant dimensions collapses the design space to concentrate on its most important aspects. The motif is a meta-pattern or template from which candidate concrete designs might be produced by varying parameters along significant dimensions. The system concept appears as an eidetic intuition in Husserl's terms beyond the noematic nucleus of the minimal system. Thus, here we see the place where essence perception arises, and what Peirce calls abduction. We step outside the logic of the standard syllogisms that allow induction and deduction and see that the syllogism has a third form which was not considered relevant in antiquity, but can be seen to be the basis of projection of the scientific hypothesis. Peirce pointed out this third form of the syllogism, and used it to construct his pragmatic logic that relied on abduction. Husserl, in a similar move, pointed out that essence perception allows us to understand things without induction or deduction, but by direct apprehension. The system concept is just such an abduction or essence perception. But it is ineffable, so that it can only be represented on the basis of techniques which have a categorical cardinality (in Peirce's sense) between the Thirds and Fourths. We can guess that the categorical cardinality of these techniques is about three and a half. They are based on the duals of Linearity and Partial Order with Distance. In terms of software engineering methodologies, these are the minimal methods called Mapping and Virtual Layered Machine. Here, mapping that appeared as the link to truth in the systems engineering process is explicitly defined. The inverse of the mapping is the concrete representation of the combined functional and physical architecture as a layered machine. The machine must have an abducted or directly intuited design that is its core. Machines are embodied theories, as Persig has said. So here, at this third stage, the machine which is designed appears at the same moment that the means of mapping is defined. The design occurs through the advent of the dual minimal methods. Other methods bridging between other viewpoints will appear at the next stage of the unraveling of this systems theory.

The concept appears when the minimal methods as defined by the methodological distinction duals are brought into close juxtaposition. But they will tend to collapse into full ordering at which point the abductive possibility will vanish. The application of linearity and partial ordering with distance to the same eventities allows this juxtaposition to occur. Here we can see that linearity has an affinity to that part of the system concept that appears as a motif or template. Partial ordering with distance has an affinity for the part of the system concept that appears as the selected significant dimensions. This is because distance introduces a spatial metric by which dimensions may be defined. As long as these two dual methodological distinctions are held together yet apart, the system concept can appear. As soon as they collapse into a full ordering, then the system concept as an abduction or eidetic intuition vanishes. The illusory continuity of full ordering covers over their possibility.

Seeing the designed object or machine as a conceptual whole is not yet seeing it as a system. To be a system, it must have a showing and hiding apparatus as well as a mechanical apparatus for movements of parts. The design concept is like the embodies mind as the mechanical aspect is like the body. Thus, we see that the mind/body dualism established at stage two appears again here at stage three in another guise. Here the synthesis of Thirds into a Fourth dominates the machine as an assemblage of parts, giving it a static formal-structural wholeness.

#### **23.4. Stage Four**

At the next stage, full ordering appears as the combination of linear order and distance. This is where the real number system with its algebras and geometry appear. Here the minimal system appears geometrically as a tetrahedron, the simplest form and algebraically as a set of four simultaneous equations with four unknowns. Here what Godel called an “arithmetic,” which was an algebra combined with a logic, also appears. Godel’s proof holds sway here where he shows that the combination of algebra and arithmetic (or geometry for that matter) cannot be reduced to any axiomatic system. Full ordering has an implicit and hidden flaw which is seen with the advent of the transcendental numbers. These are real number sequences that are infinite and cannot be generated by any function. At the very point where full ordering appears, it is undermined by the weakness of its algebra (or geometry) which does not allow axiomization and the appearance of irrational numbers (square root of two) and transcendental numbers ( $\pi$ ).

Full ordering is the production of illusory continuity. It is with real numbers that

the possibility of the calculus becomes a reality. Without the real number, you could not integrate or differentiate. The real numbers allow you to approach infinity or infinitesimally in increasing or decreasing increments. Full ordering is the epitome of the present at hand. In real numbers, we can model dynamic systems as systems of differential equations. Both continuous and discontinuous functions may be modeled with precision. In the real number system, not only are relations reversible, but you have a metric that allows you to know how far apart the related elements are in space or time or both. Here spacetime as an envelope appears. This envelope which encompasses the eventities of the minimal system can be viewed as a place-temporality ( $x+y+z-t$ ) as spacetime, or in terms of causality as Minkowski timespace (past-present-future + nowhere). Given these two views, when the actual elements of space and time are broken apart, we get two further viewpoints called Data and Event when related to computation which sees memory and cpu cycles. The advent of these two viewpoints, when added to the viewpoints of Function and Agent, gives us ten more minimal method bridges which have already been described in an earlier essay. There is an unreconcilable gap between the fully ordered viewpoints and the partially ordered viewpoints which the minimal methods attempt to bridge. The full set of the minimal methods give us a means of modeling the behavior of the dynamic system. Thus, when we move to this stage, we are now able to model the behavior of the minimal system fully even though we cannot fully capture its design concept. These models capture exactly what occurs in real space and time as modeled with the real number system. They cannot fully capture the functioning of the designed machine as built which only approximated by either the continuous or discrete modeling. The built machine is a combination of continuous and discrete aspects -- like a lave (wavicle, wave/particle). Our models of systems are always caught between these two different horns of the modeling dilemma. Our models are projected upon the illusory continuity of the real numbers which give us an infinity of points between any two points along with reversible relations and a metric.

It is at this stage that the system appears as a showing and hiding apparatus, which is to say a gestalt. The minimal system appears upon the surface of the real space as the tetrahedron floating in the endless homogenous three-dimensional space. But that tetrahedron really has three different ways it appears within that three-space. It also appears as a minimal knot, as a torus, and as a mobius strip. Notice that the knot is made up of a one-dimensional self-interfering closed strand with 720 degrees of angular change. Notice that the mobius strip is a two-dimensional surface with one twist that makes it so it only has one side and one edge globally,

though it appears to have two sides and two edges locally, and it too embodies 720 degrees of angular change. Notice that the torus is a solid closed form in which there exist two circular components at right angles which also embodies 720 degrees of angular change. The tetrahedron is also a solid, but can be viewed as a set of surfaces or lines or even just four points where all the elements are equal length or size. It, too, embodies 720 degrees of angular change if you add up all the angles of its triangular faces. Four pi is a crucial threshold of complexity which has appeared before in this set of essays. The point is that the minimal system has several different faces. It has different geometrical embodiments. But we may also view it as a lattice which appears from one and differentiates and then returns to one. The tetrahedron is a special threshold of complexity in interrelated concepts. The geometrical interpretations are emphasized by us because of our Greek heritage. The Greeks emphasized the concrete representation of conceptual thresholds as objects in real space which we map as a gloss to the lived space of our lifeworld. This is a way to separate ourselves from our own lived space, and objectify it as a flat metricized container. The showing and hiding of the system presents us at different times the different views of the minimal system on the surface of real space. We do not necessarily recognize that it is really the same threshold of complexity appearing differently in different contexts. As a form, we see the different views as orthogonal to each other. It is only when we look deeper that we see the structural relation that says that these are all expressions of four pi self referential change. Thus in real space, we see that the minimal system that embodies possibilities built into that space is both formal and structural simultaneously. Thus, the minimal system is the simplest combination of formal elements into a structural configuration. This same kind of juxtaposition can be seen in the bringing together of logic and arithmetic to compose a system that cannot be reduced to axioms. The difference between the terms of reference for the four views of the minimal system that renders them orthogonal and non-commensurable is exactly the same that introduces the non-reducibility of arithmetic combined with logic to axioms. It is the same kind of structure that makes non-rational and transcendental numbers a possibility within the real number system. We think of the real system as transparent, but in fact, it is opaque. It is opaque because the views of the minimal system in geometry are non-commensurate despite a clear deep structural relation. It is opaque because algebra and logic cannot be reduced to axioms. Algebra is an expression of the relations between elements in real space or Seconds. Logic is the expression of Thirds. The non-reducibility to axioms of algebra and logic together is more evidence of the split between the partially ordered viewpoints and the fully ordered viewpoints. It

is from the vantage point of the functional or agent viewpoints that we see the deep structural connection between the views of the minimal system. It is invisible within geometry itself which would see these as unrelated geometrical forms. But when we compare how they function to each other, and then compare the basis of their autonomy, we see the deep structural linkage around the locus of four pi. We see that transcendental numbers also are points in the grid of real numbers that cannot be produced by any function. They are autonomous variety producers that go on to infinity. There are certain aspects of the real numbers that can only be seen from the vantage point across the gap which divides them from the partially ordered viewpoints. The real numbers embody Seconds from Peirce's categorical vantage point. They are the epitome of pure relations which are metric and reversible. They are relations that let you know exactly where you are. Relations that make you feel safe. But little do we think that these Seconds are really illusory continuities projected on our lifeworld. Little do we think about the nature of the opacity of the real numbers that allow us to model so exactly spacetime relations between the minimal system of eventities. Here we see the cluster of eventities within the realm of special relativity and Minkowski spacetime. Each eventity has its own inertial frame of reference. In computing, this appears as the necessary lack of a global clock in a distributed system. It is of interest that Seconds appear last of all. Relations are artificially contrived and must be built up in a series of steps. If we reverse those steps, we enter the substrate of the production of the illusory continuity by ideation.

The autopoietic machine must appear in a spacetime region. This is part of its definition that it must be embodied. So we see that each layer of the increasing power of methodological distinctions leads us from one aspect of the definition of the autopoietic system to another. The autopoietic system is fused function and autonomy. It views the rest of the universe beyond its boundaries as perturbing firsts. It is a designed machine and, in fact, it imposes its design on itself in an act of self-organization. And it inhabits a neighborhood of spacetime which gives it an embodiment. The definition of autopoietic machines is implicitly a definition of the autopoietic machine. But we need to go beyond this to understand the operation of the autopoietic machine. Because up to this point, we can merely see how the autopoietic machine is defined in opposition to the definition of the allopoietic machine. By understanding the extension of the taxonomy of the methodological distinctions by the kinds of hyper complex algebras, we can also understand the operation of the autopoietic system and the true difference between it and the allopoietic machine.

It has been shown as we went along how the first two meta-levels of Being became points of view at stage two. It would be good to look at that point again now that we have reached the threshold of the production of illusory continuity or ideation. The threshold of illusory continuity is a pure plenum in which all real numbers are equally available. It is the analog in the mathematical realm of Pure Presence or Being<sup>1</sup>. The ability to pick out any number at will and indicate it was associated with autonomy and agency. The indicator and the indicated may be seen as agents. But the realm within which indications are made is the plenum of pure presence or equi-availability. When we make a calculation within that realm using arithmetic or algebra, we are grasping and transforming some numbers into other numbers using functions. Arithmetic does calculations directly on real numbers, whereas algebra does these operations on virtual numbers or variables. Holding a number within a variable is the epitome of grasping. Algebra does the manipulation, and it is logic that determines whether the calculation or manipulation of equations is correct. Algebraic formula can express states of affairs that are not true. Without Logic Algebra does not connect with reality. It is the combination of Algebra and Logic for which Godel's proof holds. Logic sets the standard for the manipulation of equations. That manipulation follows the proof process. But when we attempt to reduce the Algebraic system that includes logic to a series of First principles, the proofs fail. Axioms are Firsts. They, like Requirements, are independent isolated unproven aphorisms. If Logic could ground Algebra in axioms, it would be providing its own ground. It would be an example of transcendence grounding itself -- termed by M. Henry: Ontological Monism. The Thirds of Logic would use the Firsts of axioms to capture the Fourth of the Algebraic system that contains many equalities or Seconds. Thirds would be dominating Fourths by using Firsts and Seconds. If this were possible, then Fourths could be reduced to Thirds, then Seconds and ultimate Firsts. Fourths are non-representable and non-reducible to Thirds, Seconds, or Firsts. In fact, each Peircian category has its own sui generis reality. There is no reduction within the series. That is why there is a series. Now Algebra is a Third as well as Logic. Logic is a Third because it uses syllogism. Algebra is a Third because it intersperses operators and equal signs. The simplest formula is  $A \text{ op } B = C$ . This is a triangular relation between the two terms and the result, using the operation and the equality sign to structure the three part relation. Thus, we notice that we have a structure like that in the discipline of systems engineering with Functional architecture and Physical architecture where two Thirds emanate from a First. In both the case of Logic and Algebra, there are certain axioms necessary to formulate the basic relationships in the formal system. Out of there two working together arises algebraic mathematics as a whole. The

process of simplification or theorem proving, which are opposites, are where Process Being enters the picture. Process Being produces the temporal gestalt of the proof which includes time that cannot be represented in the formal system. The fact that the two Thirds working together cannot produce the Fourth is what necessitates the existence of the structural system. The structural system takes into account time. It explains the leap from proof step to proof step. It gives a picture of the system as a whole which is temporalized and bridges the gap between the two Thirds. The best example of a structural system is the General Systems Theory of George Klir. The best example of a formal system is Laws Of Form by G. Spencer-Brown. But as the Thirds stand independently of each other, we see that the Structural system cannot really bridge the gap. It can only offer explanations of the underlying structure. It does not have proofs that are strong like the Thirds are able to produce. The Fourth is a whole defined by the Thirds and explained by the Structural system. That whole is not reducible to its parts, and so Godel's proof holds. The fact that Godel's proof holds, shows us that another kind of Being enters the picture between the two proof structures (the proofs of Algebra and Logic itself). That third kind of Being is called Hyper Being or Being<sup>3</sup>. It can, in fact, be seen as the cancellation of the two Thirds with each other. This happens when it is realized that the two thirds are, in fact, nihilistic opposites. But at first it is just a foreboding which appears as Godel's proof. Once it is realized that the formal systems that work together to try to dominate the Fourth have no foundation and that Being cannot ground itself, then the set of formal systems begin to unravel. We realize that Algebra and Logic are inverted images of each other, and they begin to cancel as functors between concepts appear and we realize that any formal system has the same basic structure regardless of content. Multiple formal systems cannot dominate a Fourth. The most that can be done is the production of structural explanations. But proofs cannot be done in structural systems, only in formal systems. Structural systems are like our minimal methods. They are at some fractal level of methodological distinction between Three and Four. In the depths of the structural system is a gap that cannot be breached between explanation and proof. This gap is the hiding place of the Essence of Manifestation -- pure immanence. Pure immanence hides within the process of manifestation. The discontinuities between the steps of the proof are somehow absolute. This is why new things can come into existence. We can always innovate in our proofs, and the system of Algebra and Logic is somehow cracked so that new configurations are always possible. This crack shows up in the complexity of Real space. Real space has structure implicit within it. This implicit structure, along with the many infinities that inhabit Real space, make it a wild region. Thus, we get a hint of where Wild

Being or Being<sup>4</sup> enters the picture. After the cancellation of the two Thirds, what is left is the implicit structure of the Real numbers and their infinities. They are opaque instead of transparent. When we begin living in this transparency, then we see that there is more in the designated-as-real world than we could have ever hoped to capture with our formal-structural system. In fact, the formal-structural system is an attempt to suppress this upwelling of variety where, for instance, we see that the torus, know, mobius strip and tetrahedron are all the same thing from different kinds of view. We separate mathematics into narrow specialities, but seldom look for the crossover between these specialties that have significance. Category theory provides some relief to this by establishing the ability to create functors between separate categories, and thus see isomorphisms. In fact, we notice that our Catalyst viewpoint, once it connects with the other viewpoints, attempts to establish these connections. It attempts to establish all the relations or all the embeddings of a particular kind of viewpoint. So we see the Catalyst as the positive aspect of the negativity of the Essence of Manifestation. The Catalyst sees the outpouring of variety as positive instead of negative. All possible embeddings and relations between all four viewpoints is the ultimate interference pattern of manifestation itself. From out of that interference pattern, virtual particles arise only to be destroyed again by cancellation. In the clouds of those particles, many phantoms appear only to disappear as the patterns are seen as not merely random. The patterns are schizophrenic. This is because we are not used to apprehending meaning. We are only used to projecting significance and repressing meaning. If we stop frantically projecting in our anxiety about the groundlessness into which we are falling, then we would see that the meanings have a subtle pattern of their own when undistorted by the repression. That pattern weaves together the Well and the Tree into a single image. The upwelling of the logos is the growth of the physos. The Chi which comes from us and from outside us is unified and lays down a single pattern or Li.

## Stage Five

At the point that we have constructed the illusory continuity of the real numbers, we must switch to another way of looking at the structure of systems theory. We switch from looking at it in terms of methodological distinctions to looking at it in terms of algebras. As far as algebras go, there are a finite number of possible algebras that approach the power of the algebra that manipulates the real number system. We are actually talking now about generating the complex numbers as an addition to the real numbers. With the complex numbers, we generate the dual of



the real number system. That dual, like the mobius strip, has a twist in it analogous to the geometrical twist but which defines the singularity  $i$ .  $i$  is the token that indicates the difference between the imaginary numbers and the real numbers. There is, in fact, no real difference between the numbers as such, but instead, the significant feature is the group which allows  $i^2 = -1$ . This twist allows the quadratic equations to be solved for their roots. The group structure of the complex numbers has the structure of rotations in four dimensional space. Thus, the move that adds imaginary numbers is similar to the move that posits higher than three geometrical dimensions. It is an appeal that calls for synergy. Here, synergy appears as the twist that allows quadratic equations to be solved, and it also appears as the reuse in higher dimensional platonic solids of lines and points to produce very complex polytopes with a relatively small number of lines and points. The imaginary space, and the fourth or higher dimension, is the place where the synergy of the Fourth is realized. Thus, when we move into that realm we are entering a region in which “synergy” is the by-word, and the inability to reach synergy by the formal-structural system is left behind.

Now we posit that there is a kind of system that exists at this level beyond the formal-structural system suspended in Real space. That kind of system is the Dissipative system. It has been defined by Prigone and discovered to exist in chemical processes. The dissipative system comes in two forms corresponding to the left and right twist of the mobius strip. Either it is a system that pours entropy out of the system into the environment, thus creating order within the system, or it pours entropy out of the environment into the system. The first example is the neg-entropic dissipative system. The second example is the catastrophic system which is disintegrating into the environment. The dissipative system thrives on the basis of catastrophe either way. The setting up of the boundary of the dissipative system may be seen as a catastrophe from the viewpoint of the environment. The dissipative system is an anomaly that stands against the current of thermodynamics. It is like having water flow uphill. It can occur in special circumstances, but it is a fairly rare occurrence.

We will relate the possibility of the dissipative system to what might be termed the openly-closed system. Dynamic systems modeled in the Real space may be seen as either open or closed. But we will define a system that is closed but at the same time open. It is closed in the sense that nothing crosses its external boundary. However, it is open inwardly instead of outwardly. This is possible because for a given system we can posit that it has several structures that define its inward

articulation within the limits of its form. These different structures do not exactly match each other because of Godel's proof. This means that no one structure can reduce the formal system to a solid axiomatic foundation, so that each of the different structural explanations interfere with each other and, taken together, leave singularities of unexplained anomalies within the framework of the overlapping structures. These singularities are open, and certain influences arrive there from nowhere. In ancient times, these were known as oracles. Today we may call them liminal areas. But the system is open to higher dimensional influences through these gateways. These gates are analogous to the singularity *i*. They are analogous to the higher dimensional spaces. We can see this kind of structure in the work of Victor Frankl on meaning. We can see that this is exactly what Husserl found in relation to Kant's metaphysical system. Kant laid down some rules for what is admissible to reason, and thus created a closed system which described ideation. Ever since that point, all the philosophers attempted to get outside the Kantian system without crossing the boundaries he laid down as sacrosanct. In the end, it was Husserl who managed to do this by inventing another dimension that is not accounted for in Kant's metaphysic. Husserl can cross in and out of the Kantian base system without crossing the boundary, but by subverting it in a way that does not directly violate its integrity. The openly-closed system is a model of this kind of higher dimensional bypass. We say that neg-entropy occurs in the dissipative system, and that it orders itself. But no one asks where that order comes from. Order pours into the system from where? We know disorder pours into the environment from the dissipative system, but we do not know where the order actually comes from. Well, it comes from the flaw in spacetime which is the interface between spacetime and higher dimensional spaces or between the real numbers and their mirror image. Order flows from a singularity. In the case of Plato's Laws, it is the lawgiver who is a singular human. In the case of dissipative system, it is from a catastrophic twist in the chemical structure that produces the seed of the pattern which comes to dominate within the boundary of the system. Each dissipative system has a special boundary. That boundary acts as a filter, allowing only passage one way or controlling the passage of materials between the system and the environment in more complex asymmetrical ways. The asymmetry is seen as the notion that the mobius strip has only one side globally but two sides locally. And the same is true of the edges. This asymmetry, which allows one boundary to play two roles at any given point, is the basis of filtering which allows the entropy to flow one way and not the other. The singularity at the center that allows order to rush into the system is balanced by the filtering boundary that allows entropy to pass but conserves order. The singularity at the center of the

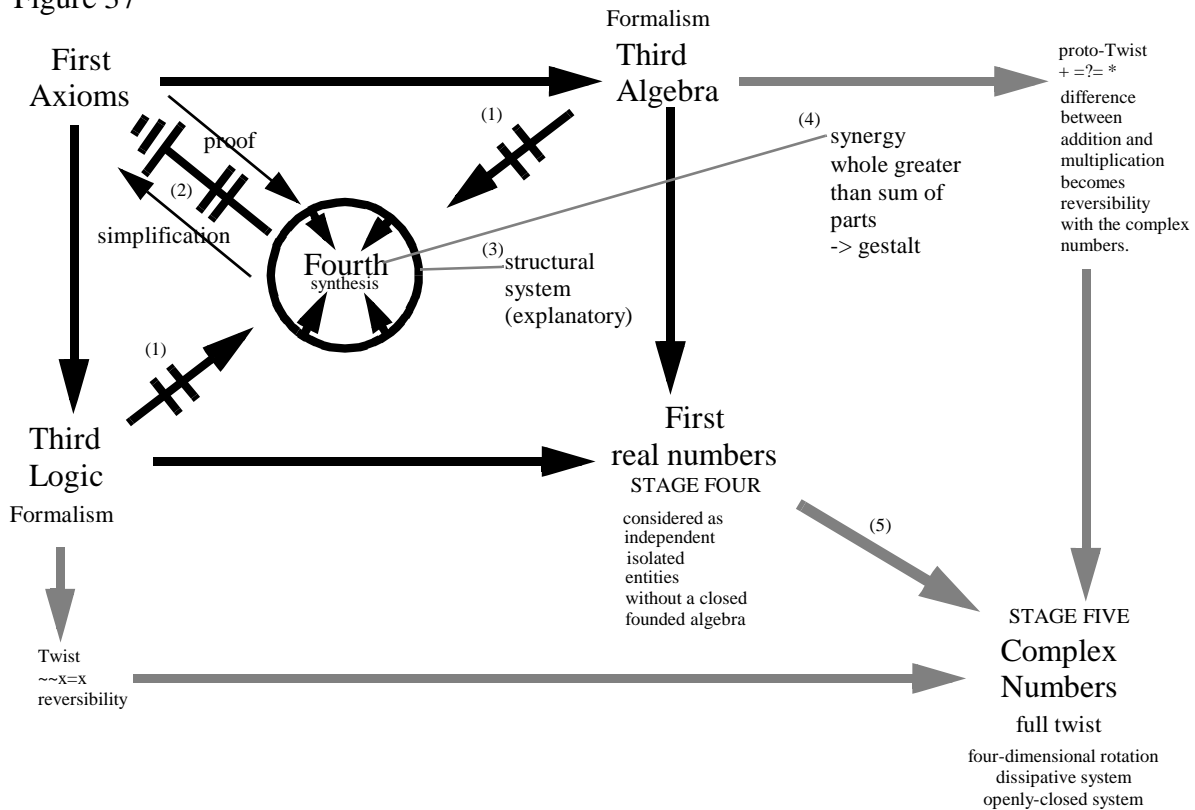
openly-closed system and the twisted boundary work together to define the regions of the inside and the outside of the system in terms of the nihilistic opposition of too much order and too little order.

We notice that the fifth stage is opposite the third stage in the unfolding of the methodological distinctions. We note that the formal-structural system cannot capture the Fourth of the system concept that arises as a synthesis out of the two thirds of algebra and logic. At most, the formal-structural system, by applying different structures, can define the singularities within the aggregate that embodies the whole. Then the Fourthness, as order, pours in upon the aggregate from the singularity and thus gives it a wholeness greater than the sum of its parts. The formal-structural system is the opposite of the dissipative system. The dissipative system is a simple neg-entropic dynamic which is equivalent to the rotations in four-dimensional space that can together make possible perpetual motion. The complex twist, the mobius strip, when set in motion, gives us a stable dynamic base that does not exist in ordinary dynamical systems. That stability comes from the appearance of reversibility of the motion around the singularity. The complex numbers are a very special representation of the interval with its phases. The real part is one phase, and the imaginary part is the other phase of this interval. Here the interval is built into the deep structure of the algebra and not just posited as part of the features of the numbers themselves. Complexity completes the formal-structural system by introducing the interval's reversibility into the structure of the algebra. This lets us see that systems with multiple overlapping structures may become openly-closed, and thus have sources of order within them. These sources of order are seen by the Catalyst viewpoint. But to the formal structural system, they are merely nodes of pure immanence, of what can never appear which, like the unconscious, orders conscious contents through the action of differing and deferring of DifferAnce.

The complex algebra is a halfway house between the system and the meta-system. It is not clear if it deserves its own ontological emergent category. It is a system and not yet a meta-system. But what is important is that it is a system with a very special dynamic. It cannot be said to order itself. Instead, order appears from nowhere at the center of the dissipative system and spreads within its boundary. Entropy moves through its filtering boundary and disorders the environment more than it might normally be to compensate for the addition of order from nowhere inside the system. The difference between too much order inside the system and too much disorder outside is a nihilistic opposition that is important to note.

Figure 45:

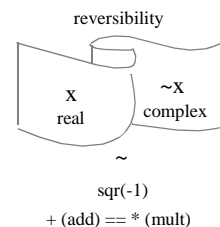
Figure 37



- (1) TwoThirds cannot capture all the aspects of a Fourth
- (2) A Fourth cannot be reduced to axioms; thus systems do not have grounds and cannot ground themselves.
- (3) Even a structural system, which is weaker than a formal system cannot capture the Fourth
- (4) A Fourth is a whole greater than the sum of its parts, i.e. a gestalt. (A system is a gestalt.)
- (5) The proved unfoundedness of the real number system leads to the consideration of other algebras.

Godel's proof:

The act of combining algebra and logic in order to ground the combined system by reduction is exactly what prevents the grounding by reduction. This is the same as the quantum effect of observability.



Logic appears at this level in some of its characteristics. The double negative is a similar kind of structure  $\sim\sim X = X$  is analogous to the  $i^2 = -1$  (transposing symbols -  $\rightarrow \sim^2 i / 1 = i / 1$ ; this is not to say that these symbols are meaningful, but only that the elements are isomorphic for a reason). We add to this the ability of logic to prove, based on impossibility and the excluded middle, and we have the strong conventional logic which is equally as blind as it is strong. We see that the kind of logic that belongs at level four is intuitionistic logic that does not allow proof by impossibility and perhaps that tempered by reconsideration of excluded middle. But our conventional logic, which we owe to Aristotle, definitely fits at this fifth

stage of our unfolding systems theory. So when the algebra is connected to the logic in Godel's proof, we are actually getting some cross talk between the pure Third of Algebra and conventional logic, which are at different stages. But then again, we can see that Algebra has the reversible structures of multiplication and addition where  $1^2 = 1$  or  $0+0=0$ . We note that it is this difference between the operations of addition and multiplication that the complex numbers are meant to solve. A negative multiplied by a negative gives a positive. The complex allows negative numbers to be generated by multiplication of the same number by itself. This reduced the difference between addition and multiplication operations. So we begin to wonder if both of these Thirds (both Algebra and Logic) are not, to some extent, contaminated with the reversibility that becomes apparent in the complex numbers. Reversibility in general is what appears at this point in the infolding of the minimal system on itself. Reversibility is the essential precursor of reflexivity. Reversibility is also in the form of the Chiasm, the essential structure of Wild Being. Here we have some of the inherent structure opaquely embedded in the Real numbers manifesting itself. This gets taken up and expressed in the logical and algebraic systems that manipulate these numbers or logical symbols. It also embodies, to some degree, what it is within the Algebra/Logic complex that cannot be reduced to axioms. Axioms are purely present at hand. If the system of algebra/logic could be reduced to the axioms, then we would be able to say that no other kinds of Being are necessary because everything can be expressed as a function of Pure Presence.

The production of extra dimensions is the dual of the production of singularities. In some sense, the extra dimensions of four and higher dimensional space are the inward structures of the complex singularity *i*. The singularity is at the heart of the dissipative system. Through it, information pours into the system from the inside instead of entropy from the outside. As a result, entropy pours into the environment from the dissipative system. The information pouring into the system, which is perceived as increased ordering, comes from higher dimensional spaces or through higher dimensional spaces from lower dimensional spaces, thus circumventing boundary crossing at lower dimensionalities. The flow of information into the dissipative system balances the flow of entropy out of the dissipative system into the environment across the system boundary. We can see this structure in Greek cities where they have an acropolis at the center, where the gods reside, and a wall at the periphery. The gods are a source of order that pours into the city through oracles and other actions of the gods. The gods of the city order the state of affairs within the boundaries of the city. The city goes to war against other cities, and thus

creates higher concentrations of entropy outside its boundaries in order to increase the order inside its boundaries. The city is open to a higher dimension inwardly, like the openly-closed system that discovers anomalies within itself due to the wrinkles in the application of several different structural systems. In both cases, these singularities or anomalies, are sources of information which do not come from outside in the normal way, i.e. crossing the outer boundary of the system. But a system with an internal twist like this one, an Escher waterfall-like structure inside, is still a system and is not yet a meta-system.

When we open up four-dimensional space, we notice that the simplest figure in this space is the four-dimensional pentahedron. That structure we have already identified with the simplest possible autopoietic system. There are four views we can take of that structure:

- Pentagrams
- Pentahedral Lattice (1-5-10-10-5-1)
- Kleinian Bottle
- 5 groups of order twenty

In the previous essays, we explored that structure in depth. It is mentioned here to point out that the fifth point that makes that figure possible can be considered as a singularity within the minimal system. If we posit that there is a higher dimensional space, then that point becomes offset into that dimensionality, and the pentahedral figure forms. But if we just consider it as embedded within the minimal system, then it becomes the anomaly that defines the openly-closed or the dissipative system. It stands for the complexity of the Real space. Real space cannot be considered apart from its algebras and the logic we use to make proofs and simplifications. Within the minimal system embedded in real space, a gap opens up, and we describe that gap using complex numbers to relate real space to the singularity at the center of the minimal system. As soon as that singularity appears, we can hypothesize that there is a higher dimensional space where that singularity is just part of the mathematical structure, and, in fact, we unfold higher dimensional space from that singularity. We discover that mathematical structure of higher dimensions has its own complexity and structure. In fact, topologists find that four-dimensional space, unlike any other, have an infinite number of “fake” topologies instead of the expected finite number of minimal surfaces. Four-dimensional space has a surprising complexity that is counter-intuitive. It is the formalization of spacetime, so it is the space in which we actually live.

We have posited in earlier essays that the autopoietic system has as its minimal structure the form of the pentahedron and that each of the views of that structure is a meaningful aspect of the autopoietic system. This minimal structure is the autopoietic ring made up of five phases and five singularities. Each phase contains a minimal system, so the pentahedral lattice relates the five Hsing to the four elements of the minimal system to produce the 20 relations between celestial and terrestrial elements. The pentagrams are attached as values to these 20 possible relations, and the five groups of order 20 signify the orbits of these 20 possible relations. Thus, the autopoietic system has a very specific structure that appears the moment the singularity embedded in the minimal system moves out into the fourth dimension to establish its own realm and unfolds its implicit mathematical relations. However, given the structure of the autopoietic system, we have still not established the operations by which it organizes itself. To do that, we must move to the next stage of the unfolding of the foundations of autopoietic system theory.

The pentahedron may be considered as a model of the static structure of the synergetic Fourth. This means it is a model of the static autopoietic system. However, the autopoietic system is not completely static, but is instead, endlessly dynamic as it strives to organize itself. Therefore, no dissipative system can model the autopoietic system because it has features that go beyond the openly-closed or dissipative system. It is necessary to go further in order to capture these dynamic aspects of the autopoietic system in our model.

### 23.5. Stage Six

Once we have opened up Pandora's box and begin considering other algebras of the kind which gives us the complex numbers, then we can ask whether there are any more higher algebras of the same kind. It turns out that there are only two higher algebras of the same kind. The next highest hyper-complex number is the quarternions which, in effect, double the Complex numbers producing three singularities  $i, j, k$  that are related to each other in terms of the quarternion group. This is, in fact, the group that relates the four axes of four-dimensional space to each other. Four-dimensional space is four three-dimensional spaces with the axes related through the quarternion group operations to each other. Many times  $i, j$  and  $k$  are used as the axes of three-dimensional space so that rotations of vectors can revolve around them as if they were being displaced through four-dimensional space instead of the axes. For us, the quarternions are very important in that they unite the structure of four-dimensional space with the singularities inherent in the real numbers considered from the point of view of algebra. With the quarternions,

we say that algebra is a general structure for dealing with many different sets of numbers like the real numbers, and that these sets of numbers have a very specific interrelation to each other. In fact, we say that the sets of numbers *real*, *i*, *j* and *k* form a minimal system of phases, and that there are four singularities *I*, *i*, *j* and *k* that generate these phases that each contain positive and negative real-like numbers. So we see here that the singularities are like the points in the tetrahedron, and the number phases (positive and negative) are like the four triangular faces of the tetrahedron. Only here, these are related to each other via the quaternion group which is the structure operated like two four-dimensional rotations on the real numbers and its cognates. This gives us a very strange inner structure for the minimal system.

However, we must go beyond this formulation because we note that as suggested in the last essay this quaternion, space is embedded in the pentahedron as the fine structure of the Kleinian bottle. We realize that this means that August Stern's Matrix Logic has an inner quaternion structure that aligns with the truth values of Matrix Logic and the eigenvalues of the Matrices of the logic themselves. We posit that the inner structure of the autopoietic system as a set of operators is identical with Matrix Logic, and that this is embedded within the pentahedral structure of the minimal autopoietic system. We note that Matrix Logic introduces the third truth value (-1, neither... nor...) but suppresses the fourth truth value (2, both...and). By this suppression it generates the 81 operations of matrix logic rather than collapsing back into the sixteen mod 2 logic operations. This introduces the Third again at a higher level. We have seen that the Third has already failed to subdue the synergetic system due to Godel's proof. At this higher level, we see that a composite picture of the synergetic system is produced from the combination of the pentahedron with its views and Matrix Logic. Matrix Logic is simultaneously a formal and a structural system. As such, it has special claims to being able to model the synergetic Fourth. We claim that the combination of the outward structure of the pentahedron and the inward operational structure of matrix logic as the fine structure of the Kleinian bottle which represents the four-dimensional rotations within the autopoietic structure, give an exact model of the synergetic Fourth. Thus, what logic and algebra failed to capture is exactly captured by Matrix Logic that includes within itself Matrix Algebra and a more robust form of logic that has embedded, within it, conventional logic. The fact that the Fourth cannot be reduced to axioms still holds. But we can model the whole dynamic autopoietic system in terms of these two mathematical structures acting together in a non-reductionist mode of thought which recognizes the independent reality of autopoietic systems as



a threshold of complexity and activity that is very useful for modeling the living/cognitive, which is to say, secondary processes with intentionality and independence within the world.

The dynamic autopoietic system is the archetype of the meta-system. We connect the meta-system to this level of the unfolding of autopoietic systems theory. The meta-system is a meta-showing and hiding of gestalts, and we will call it a “show.” In fact, it is a five-ring circus in which multiple showings and hidings are going on simultaneously. It is an entertainment system with multiple simultaneous channels. Meta-systems set rules within which systems function autonomously. Thus, meta-systems are formulations of order independent from the autonomous beings that maintain and abide by that order. Meta-systems allow multiple independent things to be going on simultaneously. Sophisticated operating systems with independent threads of execution such as UNIX, qualify as meta-systems. There are a myriad different possibilities for meta-systems, but as they impose more and more order, they approach the limit of being a system. As they allow more and more independence with respect to more and more realms of action and perception, they approach the limit of being a world. The autopoietic system is merely an idealization of the meta-system that contains exactly five minimal systems which are highly synergistically integrated. This is to say that meta-systems have different levels of harmony according to Chang’s levels of harmony (logical, interactive, mutual support and interpenetration). The autopoietic system has interpenetrating harmony. Thus the autopoietic system is actually a meta-system with the highest degree of harmony possible. This makes the autopoietic system a model of the Holoïd. Except it is a model that stands away from complete fusion. It is a model of transcendence, grounding itself, in which we can still see the structure of belonging together or the returning of the Same.

The autopoietic system imposes order on itself. It is a network of processes that produce the components out of which it is itself comprised, and then maintains its own organization as a homeostatic variable by replacing itself with those components it has itself produced. The autopoietic system is thus a network of elements that together do ordering and do producing. The archetypal example is the living cell. Autopoietic theory sees the living cell as having a cognitive component, and that the cognitive component is fused with the living component in the cell. The cognitive component is associated with the ordering of the cell by itself. The producing component makes the sub-components of the cell itself which it uses to maintain itself. The ordering component controls growth, reproduction, the

metabolism and a myriad of the functions of the cell that together allow it to live. In higher animals, this ordering component becomes cognition. There is a relativistic point that as observers of other living/cognitive autopoietic systems, we project our intentions on that system. Our projections may be far from the actual internal intentions of the cognitive/living autopoietic system under observation. So we must carefully distinguish the outward expression of cognition in terms of projected intentions from the internal intentions of the autonomous system. But there is no doubt that the autopoietic system, in every case, has its own reasons that our reason may not be able to understand.

We are not actually saying that this network of nodes that makes up the autopoietic system is a pentahedral structure. That network of the nodes in the autopoietic machine will vary depending on the kind of machine it is. We are not even saying that the pentahedron is the only such structure. In fact, we posit that there are similar structures in every higher dimensionality that may be higher order autopoietic rings. The pentahedron is merely the minimal autopoietic ring structure. The autopoietic ring is the connection between the cognitive element and the living element. In other words, the autopoietic ring in the pentahedral structure allows there to be five singularities and five minimal systems. Components of the autopoietic system must be arranged in systems. The minimal formation of these systems of components (eventities) appears as the phases of the pentahedral formation. The singularities that contain the cognitive component have a specific relation with these minimal systems of components. The pentahedral ring specifies these relations between the cognitive singularities from which order comes the minimal systems of components that represent the organization of the autopoietic system that it is imposing on itself. So the ring structure is very important to the structure of the autopoietic system connecting its cognitive aspect to its living aspect. This structure can be arbitrarily complex. Higher dimensional autopoietic rings merely increase this complexity, but also increase synergy. For instance, the fifth dimensional equivalent of the pentahedron, called the hexahedron, which has the lattice 1-6-15-30-15-6-1, has 15 tetrahedral structures but six four-dimensional structures which connect them. Thus, we immediately go from five minimal systems to 15. And as we go up the Pascal triangle, these numbers grow exponentially. The pentahedron has a single four-dimensional structure to connect is five minimal systems. The next ring up the ladder of higher dimensional spaces have six higher dimensional structures to connect 15 instead of the three you might expect. Complexity grows exponentially. This complexity grows to accommodate the high degree of harmony in these systems. We know that the autopoietic system

is a logical unity. But it is a unity with structure. It has not collapsed to identity in fusion without structure. It is a unity just prior to the collapse into unity without structure signified by Conceptual Being. That structure that it has must embody all the kinds of harmony. It is logical because the autopoietic system is closed. Like logic itself, it is a closed formal system. All its actions are in terms of itself. It has interactive harmony because all its nodes interact to produce its self-organization. It has mutual support because the cognitive singularities order the component minimal systems acting together so the different parts of the system support each other. So we see that it is at the level of mutual support that the relations between cognitive singularities and components in minimal systems becomes important. Finally, it has interpenetration because of the synergy based on the Pascal triangle where multiple organizational elements are made out of the same materials. This reuse of elements of the organization to produce more complex structures is the hallmark of interpenetration. It signifies a deep and sophisticated ordering of the organization which is built into the nature of things and is specified in a mathematical way as lattices and may be interpreted as geometrical objects in higher dimensional space. This interpenetration of elements, where one element enters into the definition of another element but does not collapse into identity, is a very important feature of the universe and mind which comes from the connection between the living and the cognitive in the autopoietic system. It is not that we discover mathematics as a realm of ideas separate from who we are as living thinking beings. Instead, in mathematics, we discover the inherent connection between the cognitive and the living within ourselves, and project it as part of the universe or mental forms. But in fact, it is the inner structure of our cognitive life. It has a beauty and elegance that is hard to deny. That comes from within us as human beings. But the whole question revolves around how we interpret that resource within ourselves that connects the cognitive to life. We can interpret it as solid geometry as the Greeks did, and introduce opacity. Or we can interpret it as higher and higher thresholds of complexity in the unfolding of binary systems that are transparent permutations of opposites. The choice is up to us. The same Pascal triangle may be interpreted both ways. It is the difference between the view that there is a material substrate to everything that is independent of us as cognitive-living beings, and the view which we can follow Loy in that the phenomenological reality is prior to the material substrate. Phenomenology is prior to the material, and the social is prior to the phenomenological. We really need to understand the social if we are to understand the autopoietic system correctly. However, the social introduces many factors that are clearly not present in many living systems. It is basically a new emergent level, and we are fortunate to find that there is another

level in our hierarchy of algebras that can support the existence of a structure higher than the cognitive-living autopoietic system.

### 23.6. Stage Seven

The next stage is where the Quarternion algebra is doubled again to give the Cayley algebra. This adds four new singularities and effectively doubles the Quarternion structure. The new singularities are called ***I, J, K*** and ***e***. The ***e*** singularity produces another limit like the real number system is to the complex and quarternion numbers. Each successive algebra has a weaker division property, and the Cayley has the weakest. The Cayley algebra is, in effect, the production of a mirror image of the Quarternion algebra. The mirroring of the quarternion allows the cognitive-living autopoietic system to reflect on itself. Self-reflexion is the next higher stage from self-organization. Essentially, this self-reflexion allows the social autopoietic system to change its ordering and experience emergence, which means radical reordering of the system.

To repeat this in other way: the Cayley algebraic structure is the mathematical basis for the *Reflexive Autopoietic* system. This structure is equivalent to the Social level of emergent phenomena. In it, the quarternion meta-system looks at itself, and thus can not only organize itself, but make up new orders to follow. Thus, it is at this level that emergent events are defined and are, in fact, the basis of the social, or vice versa as G.H. Mead intuited.

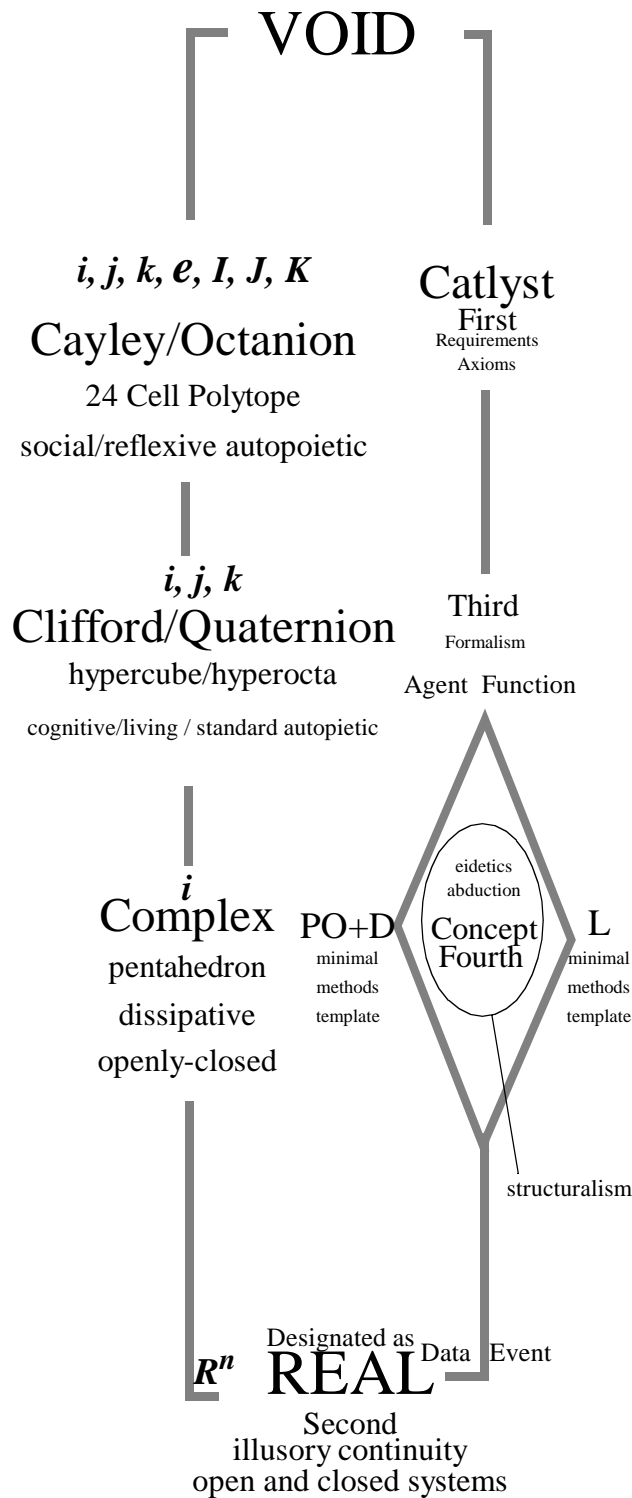
The Cayley algebraic structure is the basis for the projection of worlds. Above the meta-system, the next level of emergent category is the *World*. The social system projects the world based on its reflexivity which radiates among its members in a seemingly infinite ramification of reflecting images between members of the social group.

It is at this level that Stern defines the Hyper-logical operators. This is the level that computation would occur in his system where multiple (four) matrix logic elements are fractally combined. This computational structure is a group, and there is only one group with an order of 20 that contains a Quarternion. That group corresponds to the 24 cell polytope in four-dimensional space. Only four-dimensional space has such a structure, and it corresponds to a direct mapping from the Hypercube to the Hyperoctahedron which only exists in four-dimensional space. This suggests that the 24 cell polytope is the inner structure of the social operations that are a sui-generis reality over and above the operations of matrix logic alone. Reflected

matrix logic has group properties that overcome the forbidden operations. All hyper logic operators have a complete set of operations which allow this computational form to go beyond the blockages of the forbidden operations of matrix logic without abrogating them, forming a whole group structure. This meta-meta-system is the social which projects a world which allows emergent events without blockage because its structure is isomorphic with the structure of the emergent event itself. This is probably the first rigorous definition of the level of the social. We can connect it with what Deleuze and Guattari call the “socius.” It is the primal ground of everything we know. Ballard called it the archaic. We turn the normal list of emergent levels upside down and say that it is not quarks and fundamental particles that are the basis, but instead it is the social from which all other emergent levels devolve. Here, we are saying that the social is explicitly the reflexivity added to the autopoietic system, but that addition comes about by essentially a doubling of the structure of the mathematical basis for the autopoietic ring. This takes us to a new emergent level where there is a unique mathematical structure. It appears as the Hyper operators of Matrix logic, and it appears as the 24 cell polytope that has a lattice structure 1-24-96-96-24-1. It is a unique connection between the hypercube and hyperoctahedon that produces an all 4-d space filling lattice. It gives the hypercube and the hyperoctahedron a unique intertransformability that does not appear in any higher dimensional space.

This structure is the next higher Matrix Logic form. It subsumes Matrix Logic, and provides us with a very complex Meta-Matrix Logic. As such, it gives an additional layer of inner coherence to Matrix Logic itself which is not blocked by the forbidden operations. Thus, it is a group structure where every pair of hyper-operations taken together gives us another hyper-operation within the group structure. This hyper-operator is composed of four Matrix Logic operators in a larger matrix with a four value vector as input and as output. We can think of this hyper-operator as the simultaneous interacting logical computations of two independent agents. This combination of logical agents gives the social dimension to this Hyper-logic.

Figure 46:



The reflexive autopoietic system has the ability to re-organize itself rather than to

merely organize itself. For instance, the cell has its organizational trajectory laid out for it by its DNA patterning. Social autopoietic systems can change that patterning to produce a different trajectory. For instance, Beer talks about the Boss as giving closure to the corporation. The Boss is the one who decides which avenue will be taken. But the Boss can look at the situation and decide to do something completely different than anything the meta-systems of the organization suggest. This ability for the Boss to reflect and change the entire patterning of the organization based on the outcome of that reflection without recourse to any laid down patterning, such as the cell's DNA, is what we are talking about here. Of course, redirection by a single lawmaker acting as a tyrant is only one example of how a repatterning might come about. Another way is for the group to reach consensus that a change is necessary. But however this change comes about, or is instituted it is only social systems that are able to effect such changes in their internal organization with such freedom. All the normal autopoietic systems cannot do this unless they are preprogrammed with different modes. For instance, the transformation of a caterpillar into a moth is a catastrophic pattern change. But it was pre-programmed into the basic patterning of the organism. The organism did not decide to change itself into something completely different. The same is the case with human beings. We cannot change our bodies at will except by external means. But a society can change its basic characteristics of organization in radical ways by altering the ways individuals interact and even altering which individuals fulfill specific roles in the organization. Society is a meta-organization of creatures. If we consider bee hives, we see that the beehive itself is, in some sense, an organism and it is not truly social because it cannot repattern itself. The transformation of the hive from sedative to flying is an example of a preprogrammed change which occurs given certain circumstances. Everything the bees do as separate organisms is prepatterned. So we cannot call them social in the sense specific to reflexive autopoietic systems.

When we connect emergence, the social, reflexivity, the 24 cell four-dimensional polytope and Hyper Matrix Logic to the Cayley numbers, what are we really saying?

First, we are saying that our autopoietic system's theory clearly distinguishes the level of the autopoietic system from the reflexive autopoietic system. This is important because there has been a lot of argument whether social systems are, in fact, autopoietic. Our position has been that they are a special case of an autopoietic system which is, in turn, a special case of a dissipative system that is, in turn, a kind

of a system. Being able to generate all possible kinds of relations between eventities or system components in minimal systems is the main reason for appealing to methodological distinctions and hypercomplex algebras. These mathematical objects structure the way we look at the phenomena. When we see that the Cayley, like all the series of hypercomplex numbers, are produced by “doubling,” we see that there is some sense to the concept of an autopoietic system looking at itself in reflexion through this mirroring of the quarternion. The quarternion is a mirroring of the complex numbers. Thus, an autopoietic system is, in some sense the combination of two dissipative (openly-closed) systems. The dissipative system is somehow a combination of an open and a closed system. The doubling allows us to relate the generation of these more complex kinds of special purpose systems to the symmetry, breaking progressive bisection of complex dynamical systems on their way to chaos. In this case, the symmetry breaking only goes to eight states. Only eight singularities are produced which are the eight artificial intelligence techniques, the eight paradoxes in the software layer. These eight singularities may be read as producers of higher dimensionalities. As such, we can see that at the level of the Cayley algebra, a unique aspect of four-dimensional space to turn in on itself becomes apparent. The hypercube and hyperoctahedron have a special kind of symmetry that revolves around the 24 cell polytope. It is this special symmetry that is made use of by Hyper Matrix Logic with its group structure of order 24. This special property of the Hyper Matrix Logic, or the 24-cell polytope, is the ability to invert inwardly as well as outwardly. If we represent the minimal system as a quarternion group with four singularities being the four eventities of the minimal system, then we see that the quarternion can involute using the rotations of four-dimensional space inwardly. The addition of the Cayley allows a similar involution outwardly. Thus, the ultimate view of the minimal system is that it is possible to combine four-dimensional rotations, both inward and outward in the same structure. This structure is a kind of double perpetual motion machine. It is a perpetual motion machine whose perpetuity is tracked by a second perpetual motion machine. The perpetual motion machine tracks itself and can follow itself. This is the essential nature of reflexivity. It is social because it is two intertwined perpetual motion machines; two intertwined autopoietic systems locked in an embrace. Here, the cognitive sub-system is disconnected from the living sub-system but mirrors it perfectly. The production of the inverse autopoietic system allows the system to model itself internally. Or we can see it as two autopoietic systems where the cognitive and living aspects are still interembedded. The two together operate in perfect harmony. It is a marriage. And it is the prototype of all social relations where the mutual mirroring between



two intertwined autopoietic systems produces a whole greater than the two meta-systems together. This meta-meta-system must be a world. This archetypal marriage, intertwined autopoietic rings, is the foundation of the world. The well and the tree, or the pen and the tablet -- in the primal scene, the duality is an image of this marriage. So we see that marriage is somehow the fundamental non-nihilistic distinction. It is symbolized in the rings couples wear, but it goes very deep as a fundamental non-nihilistic distinction that founds the world by establishing the basic social relation from which all other social relations emerge. It is different from sex together or living together. It is a contract which Mithra and Varuna guard, and they can guard it because they know how to break it. It is an unseen relationship which is founded on the inner possibility of essential harmony. This is not harmony of something with itself we saw in the autopoietic system, but harmony with another which is like the self only different. It is the harmony of two selves intertwined who belong together and are the Same. This harmony with the other is what the whole of the Western tradition violates in many deep ways. It is a harmony with the other through the realization that the other is ultimately the self. When I make a model of the other, it turns out to be a model of myself. I am the Other. But this does not just mean I am alienated from my self. It also means that there is a possibility of a harmony with the other that I can strive for which is the basis of the social and is represented by the internally and externally involuting minimal system.

Marriage is not a constant relation. Marriage can be repatterned by those involved in it. My partner and I can look at ourselves together and decide that we are going to do things differently together. I cannot get this reflection looking at my own behavior because I have a distorted view of my own behavior that is different from that of a significant other to whom I am married. This is different again from any other significant other's view of my behavior or any non-significant other.

The epitome of the formalism of this highest level of special systems theory is the use of Minkowski spacetime to explain relativistic information by Jumarie. In this version of spacetime, two subjects observing the same system would, in fact, observe different information. Jumarie uses the concepts of special theory of relativity to work out the invariants by showing what each observer would observe through the other observer in comparison with what he/she would observe from his/her own inertial frame. When two observers are observing simultaneously the same thing, then the upper left and lower right quadrants of the Hyper logic matrix of four matrix logic operators are all that is used so that the observations are orthogonal.

This possibility of orthogonality of observations, and the distortion of information by multiple observers, is the basic framework for the investigation of intersubjectivity. In intersubjective viewing of a system, there are certain transforms by which one subjective viewpoint can be transformed into another. Stern treats the causal chain within the light cones in terms of positive and negative logics. These two views, when put together, give us a powerful tool for understanding the relation of subjects to the same system by their relativistic warps of information. Matrix Logic gives us the means to understand the temporal aspect of causal chains within the unfolding of the worldlines. The anti-logic gives us access to a structuralism within the formalism of Matrix Logic which is a model of the relation of the light cones to nowhere. So together, Matrix Logic and Relativistic Information Systems theory gives us a means of analyzing intersubjective phenomena on a solid formal-structural footing.

The reflexive autopoietic system is not homeostatic, but proactive and projecting. As Heidegger says, it is ecstatic, pro-jecting the world. Its nature is that of Dasein. Instead of homeostatic, we could say heterodynamic. The reflexive autopoietic system is constantly producing a heterogeneous variety of differences that make a difference. It is in constant dynamic. Because for anything to remain in one place in spacetime, it must move, specifically in circles of  $4\pi$  which make it static to all frames of reference. So in order to stand still, the reflexive autopoietic system must keep moving. We can say that the Cayley algebra is more general than the Clifford which is, in turn, more general than the Complex so that the social level is more general than the autopoietic which is, in turn, more general than the dissipative. More general in the sense that the social gives rise to the individual. Individuals cannot function without a social milieu and concretely embody that social milieu. Individuals function as organizers or disorganizers of their situations. The dissipative context of the individual is the situation. The individual's situatedness is socially defined. Deleuze and Guattari speak of the *socius* and the desiring machines. The desiring machines are the partial situations which may be positively or negatively entropic. The individual, from his/her perspective, is an epiphenomenon of the connection between the desiring machines that are the intersections of multiple overlapping situations and the *socius* that is the social context in which all situations are embedded. We do not go so far in denying reality to the individual. The individual is the autopoietic unity with its cognitive (functional) and autonomous (agent) components. All cognitive intentions function within a situation, and all actions of the agent occur within the situation. It is only in the situation that the individual desiring machines come into play. We take these

myriad situations that form the patchwork of our lives and attempt to produce a narrative or a designated-as-real illusory continuity. So we can see that from one point of view it is the socius and the situations in which desiring machines manifest that are real. But normally, in the common sense world, it is the individual and his life narrative that is real. Different theories will emphasize two and de-emphasize the other two levels and vice versa. But when we realize the parallelism between the Cayley formation and the First Catalyst viewpoint, then we say that the Catalyst viewpoint holds the position of the generalized other of Mead. The Thirds of Function and Agent are opposite the Clifford formation which is equivalent to the autopoietic system. These viewpoints are the cognitive and the embodiment of the living individual in their reversibility. They express the ability to formulate formal systems, either as algebras or logics. The algebra counts the individuals. And what is countable is deemed real. The logic verifies the truth of the individuals. The cognitive (functional/intentional) and the autonomous (agent/existence as isolated individual) aspects form a wave particle duality. This form of belonging together is a weak kind of identity with difference built in. Opposite the dissipative system is the Conceptual Fourth. It is constrained by the structural system and confined by the set of minimal methods, but is not captured by any of these. Thus, the Conceptual Fourth which has a complexity analogous to the Cayley formation, is diagonal to it. The simple-to-complex movement is opposite on the two sides of the diagram. The concept appears as a view of what is beyond the singularity at the center of the openly-closed system. It is like the otherworldly forms of Plato. It is the non-capturable synergy that is the source of order that pours into the dissipative system through the singularity to order the system. The simplicity of the dissipative system points to the complexity of the synergetic un-capturable eidetic abductive Fourth of the System Concept or System Design. This is interesting because the same is true of the relation between the Catalyst and the Cayley formation. The simplicity of the First, which is the Generalized Other, is balanced by the complexity of the minimal social, i.e. reflexive, system. These two sides to the diagram are duals of each other. They form a complex interval with the point of reversibility being the illusory continuity of the real numbers, and the limits being on both ends the void. Each phase has its own sub-interval, in the one case being expressed in terms of algebra formations, and in the other in terms of methodological distinctions. The Quarternion formation and the Thirds of Function and Agent are the points of reversibility in these sub-phases. The Quarternion formation expresses how the autopoietic system can connect the function and agent aspects together in a wavicle or wave/particle unity. This is made possible by the existence of four-dimensional rotations that make possible perpetual motion in

higher dimensional spaces. The autopoietic system can ground itself or cause itself with this very efficient higher dimensional causation. Because we are four-dimensional creatures, we can harmonize our processes to approximate these rotations which is done by setting up resonances. We can only do it through time, not in the frozen presentation of space which is seen as present-at-hand only. It takes all four kinds of Being to effectively produce this perfect rotation of the temporal gestalt, and that is why the four kinds of Being are necessary within the autopoietic system as the levels through which self-grounding Being passes, and this is why the autopoietic system has the structure of the emergent event. It does not experience emergent events from the outside because it is a closed self activating emergent event.

The eight singularities correspond to the eight kinds of artificial intelligence techniques which are hypothesized to be the paradoxes in the software layer. They correspond also to the eight trigrams from the I Ching which appear in Sidi Ali al-Jamal as the permutations of inward/outward, sensory/meaning, and Celestial/Terrestrial. These eight points which appear as the singularities are the counterpoint to the 24 cell polytope. They are central to human cognition of the universe. As kinds of artificial techniques, they are opaque and as trigrams, they are transparent. This is the difference between the binary and the triadic ways of viewing the world. We see that the progression from complex to quarternion to Cayley numbers produces a progressive bisection of singularities. These singularities operate as a system to organize the world. If that system is viewed through the flawed lens of logic that relies on the Third, then the result is paradoxical singularities in the layer of software minimal methods. If, on the other hand, the world is viewed as merely a myriad of opposites, then these singularities become merely the points of confluence of opposites as the basic opposites are permuted.

### **23.7. The Void**

The four eventities arose out of the void, and because there are no higher hypercomplex algebras, we again encounter the void as the unthinkability of what lies beyond the Cayley algebra. We can think of the seven stages of autopoietic systems theory as being like the seven chakras. They are thresholds of complexity of the unfolding of the big man, which is Das Mann, the They or the preconscious social which projects the world before we are even aware of it as individuals, before we even become individuals. The world is there, discovered as the medium in which we discover our humanity. We can turn it into the uni-verse or the

totalitarian single song everyone must sing, or we can discover it as a window on a pluriverse that contains a myriad of worlds arising and returning to a single source. That source is unthinkable, unrepresentable, unassociateable with anything we know. All we see is endless worlds, meta-systems, systems, forms, primitives flowing out of the void.

## Appendix A: Coverage

{See end of chapter for diagramic definitions of RSTU}

The derivation of the minimal methods has two distinct sets. The first shows that each of the basic embodiments have all the aspects of spacetime encoded within them so that they can be seen to be real embodiments. The second step is to show that combinations of the basic embodiments serve as substrate for the different minimal methods. This appendix will show the first step where coverage of spacetime attributes are shown for each embodiment.

### 24. *r* embodiment

This embodiment follows information through a network of variables.

#### 24.1. Correlation

Between values at  $t_0$  and  $t_1$  = strength of relation.

#### 24.2. /Cause

Causal link strong unidirectional correlation between variables and values.

#### 24.3. Value

A representation of an intensity from a set of possible values.

#### 24.4. Variable

Two holders for a specific representation.

#### 24.5. Duration

How long a value remains the same.

#### 24.6. Moment

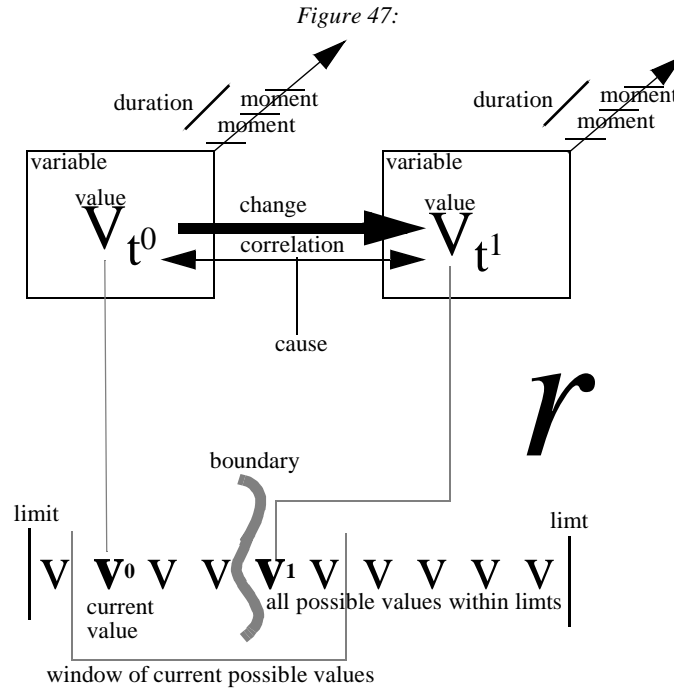
The minimal amount of time a value remains the same.

## 24.7. Boundary

Critical values at which some meta-change occurs if that value is crossed.

## 24.8. Limit

Discrete ends of possible values for moment and overall.



## 25. S embodiment

This embodiment compares the differences between two variables.

### 25.1. Correlation

Between two variable's values = strength of relation.

### 25.2. /Cause

Causal link between variable's values.

### 25.3. Value

A representation of an intensity.

### 25.4. Variable

Holder for a representation.

### 25.5. Duration

How long a value remains unchanged.

### 25.6. Moment

The minimal time a value may remain the same.

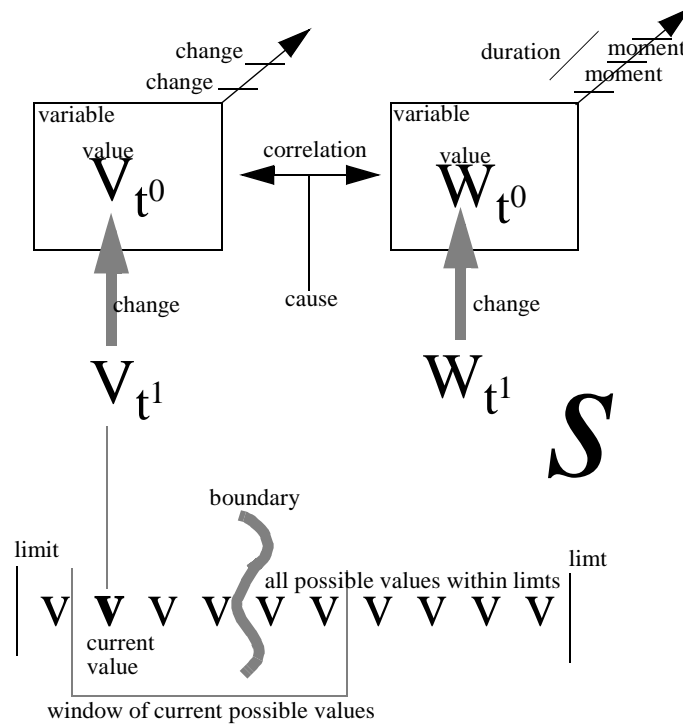
## 25.7. Boundary

Critical values at which some meta-change occurs if the value is crossed.

## 25.8. Limit

Discrete ends for possible values for moment and overall.

Figure 48:



## 26. $t$ embodiment

This embodiment looks at multiple transitions of design elements related to a single global state.

### 26.1. Correlation

Between macro state and micro state.

### 26.2. /Cause

Actions that occur during state change.

### 26.3. Value

State representation at global level for a duration.

### 26.4. Variable

Holder for a representation.

### 26.5. Duration

Length of time a state holds at same value despite underlying changes.

## 26.6. Moment

The minimal amount of time a state value can remain the same.

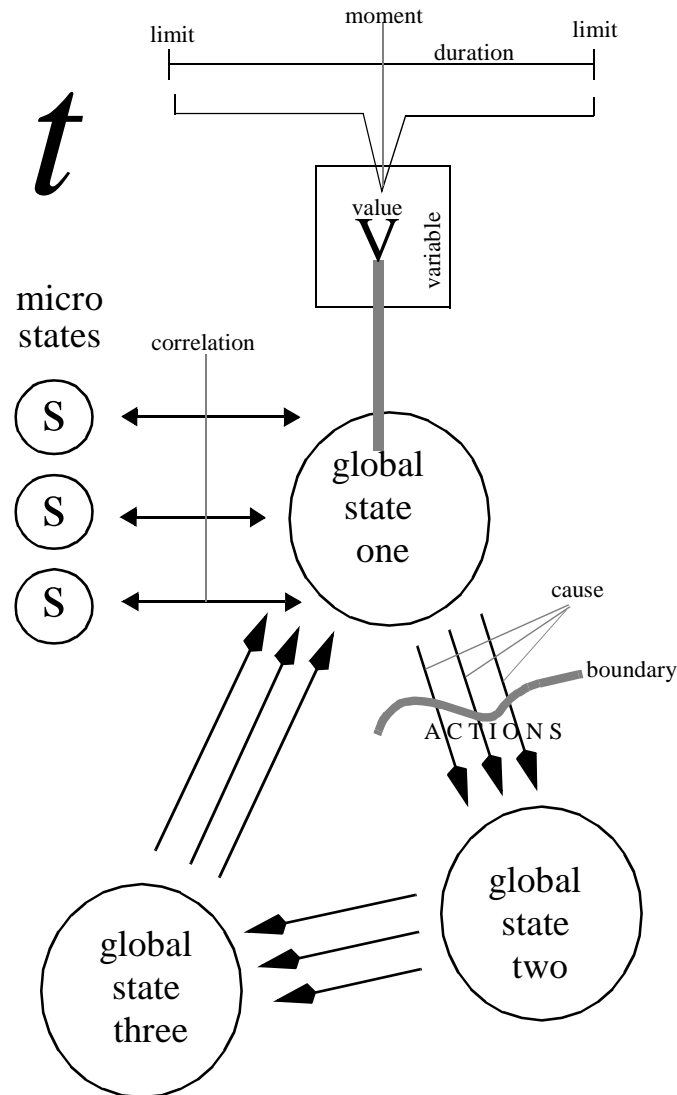
## 26.7. Boundary

Critical values of aggregate sub-values that cause a change of state.

## 26.8. Limit

The set of possible state values only these global state values are possible.

Figure 49:



## 27. $\mathcal{U}$ embodiment

This embodiment looks at multiple design element states in relation to a global transition.



**27.1. Correlation**

Between micro states.

**27.2. /Cause**

Global action changes that produce micro-state changes.

**27.3. Value**

State representation at a micro level for a duration.

**27.4. Variable**

Holder for a representation.

**27.5. Duration**

Length of time a micro state holds at the same value.

**27.6. Moment**

The minimal length of time a state value can remain the same.

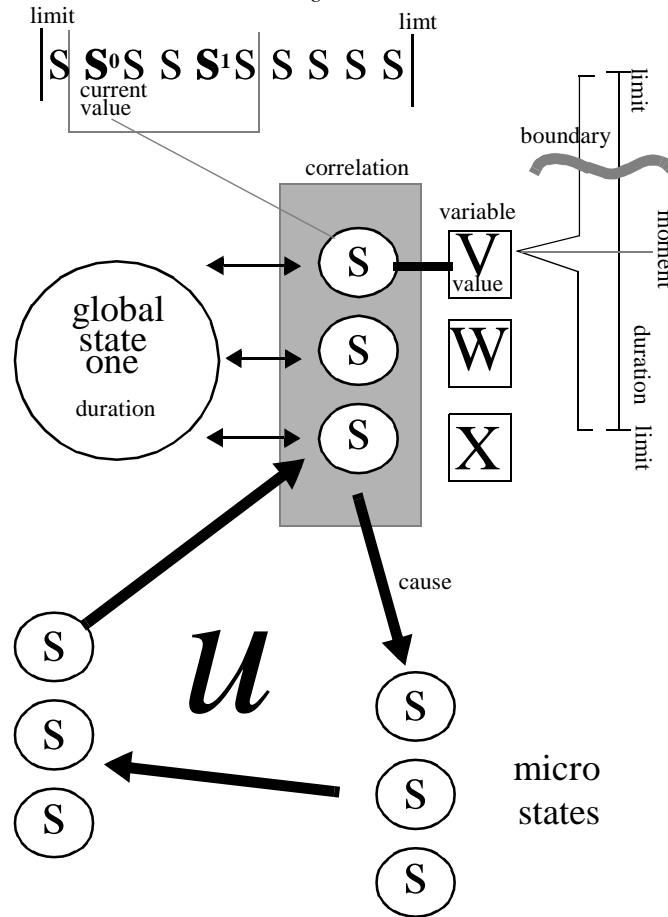
**27.7. Boundary**

Critical values of micro-states which cause meta-changes.

**27.8. Limit**

Set of possible values for each micro state.

Figure 50:

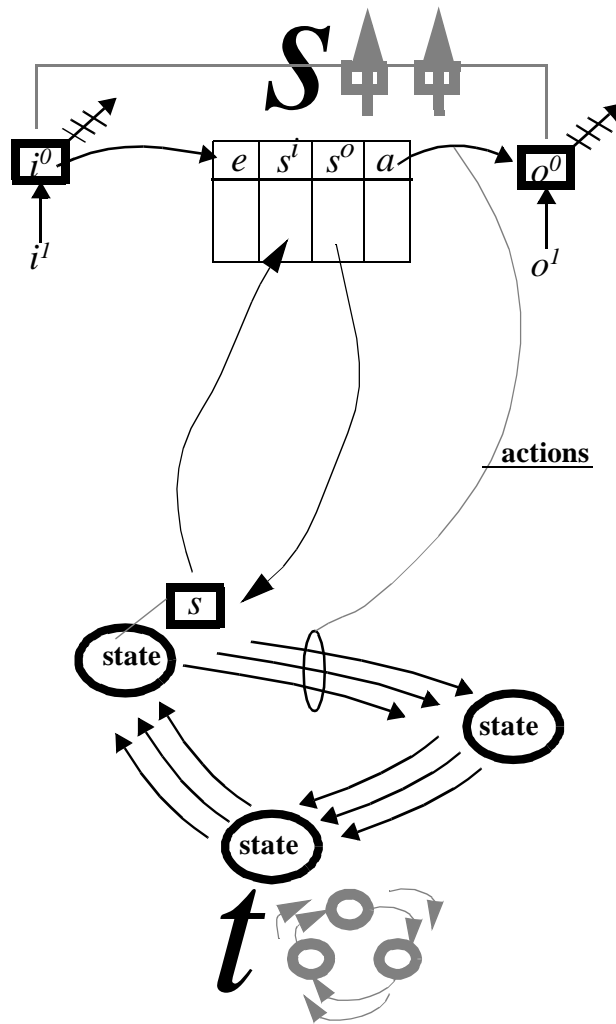


## Appendix B:Combinations of embodiments

This appendix will deal with the combinaitons of embodiments showing how each combination is related to a specific minimal method or pair of methods.

## 28. $S$ - $t$ combination = state machine

Figure 51:



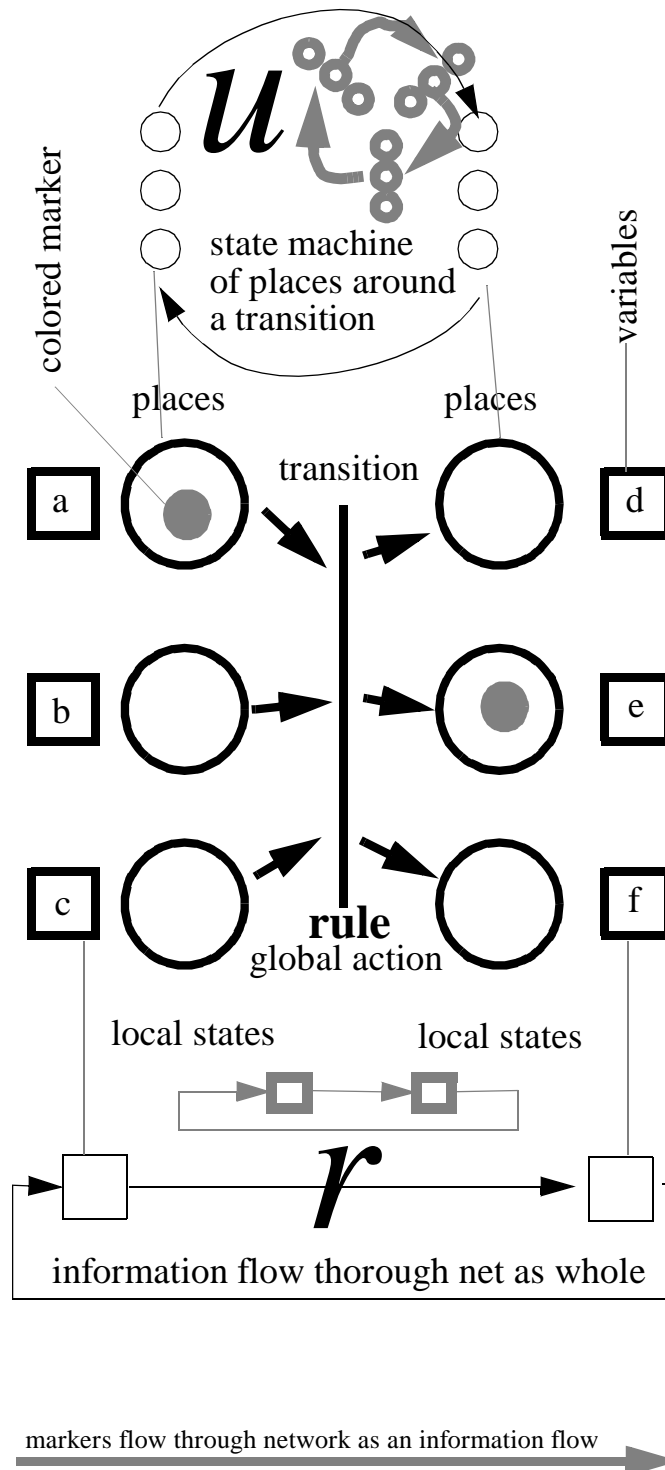
28.1. Two correlated variables equals input and outputs of state machine.

28.2. Global state equals state of the state machine.

28.3. Multiple micro transitions equals actions of the state machine.

## 29. $r$ - $u$ combination = petrinet

Figure 52:



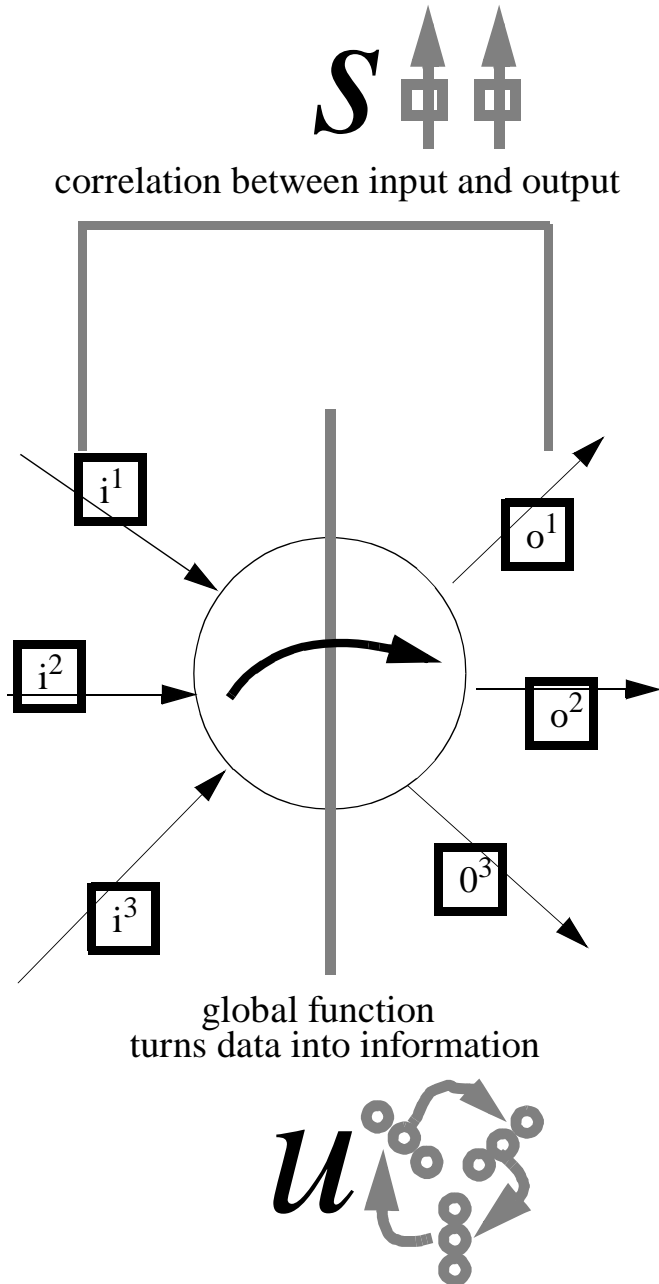
29.1. Flow of tokens through the net equals information flow.

29.2. Micro-states are states of input and output places.

29.3. Transition equals the global action between micro-states.

### 30. $S$ - $U$ combination = dataflow

Figure 53:



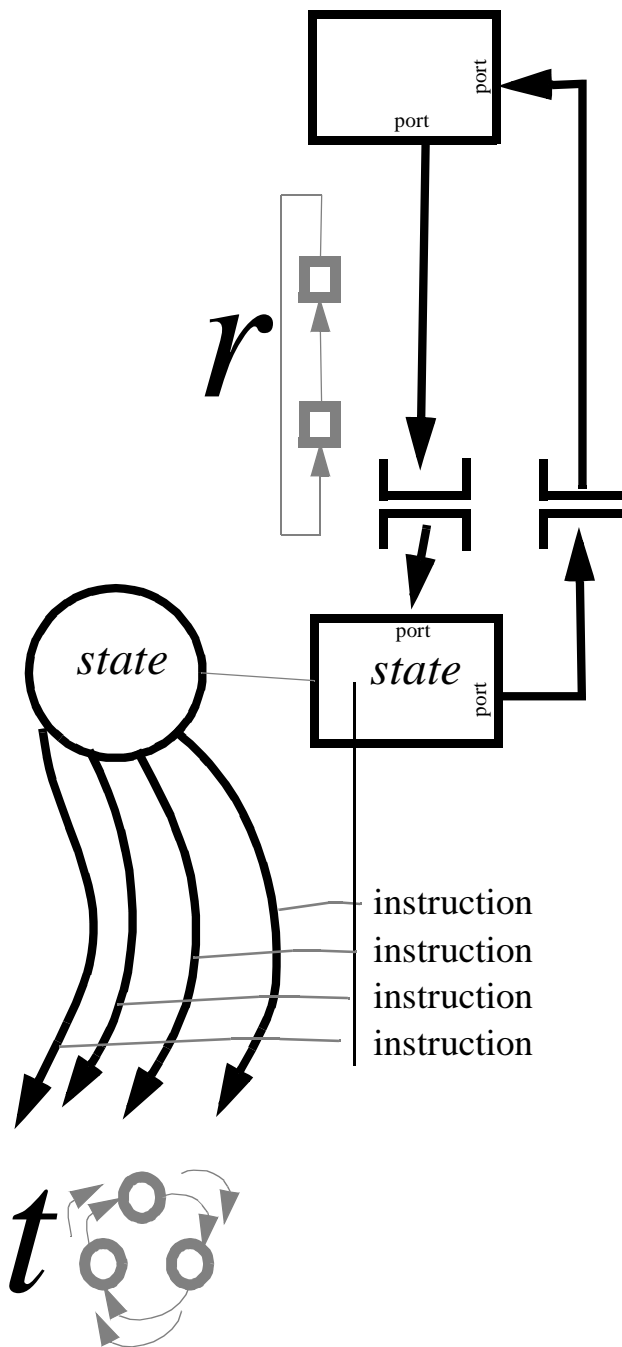
**30.1. Input and output variables representing data lines equals correlation between variables.**

**30.2. Values of input and output variables equals microstates.**

**30.3. Function equals global transition.**

### 31. $r$ - $t$ combination = darts<sup>1</sup>

Figure 54:



**31.1. Information flow equals message flowing between task parts.**

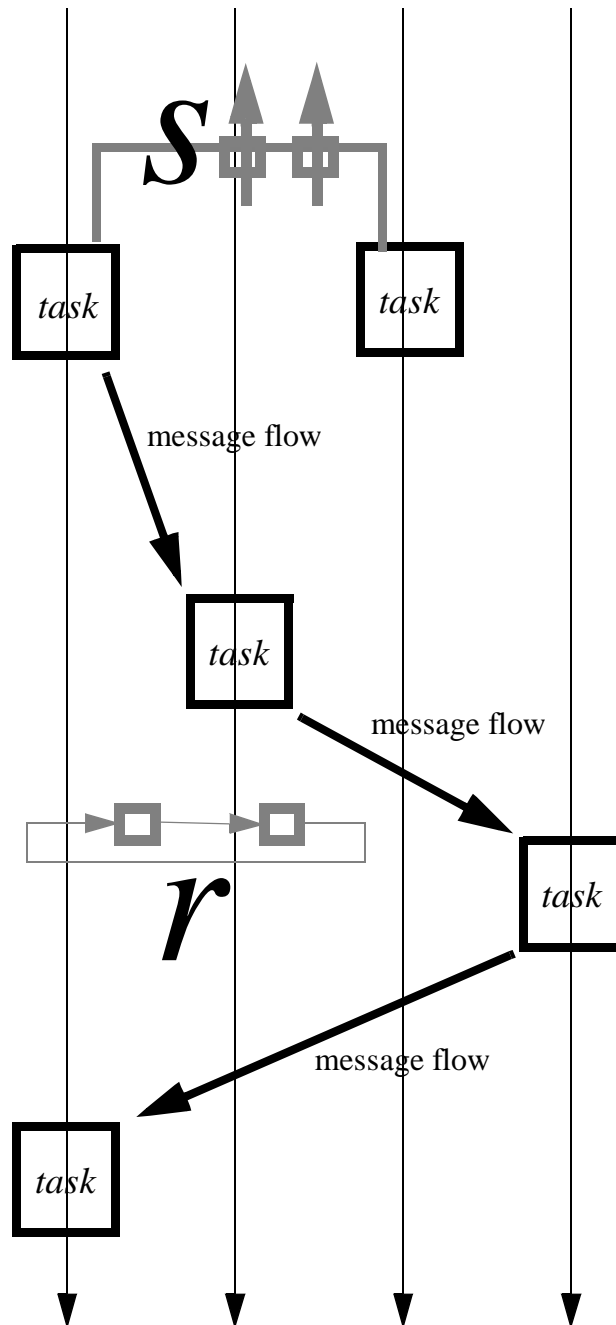
**31.2. Global state equals state of task.**

<sup>1</sup>Gomma Design and Analysis of Real Time Systems (DARTS)

31.3. Micro transitions equals instructions that a task is following now.

32.  $S$ - $r$  combination = worldlines and scenarios

Figure 55:

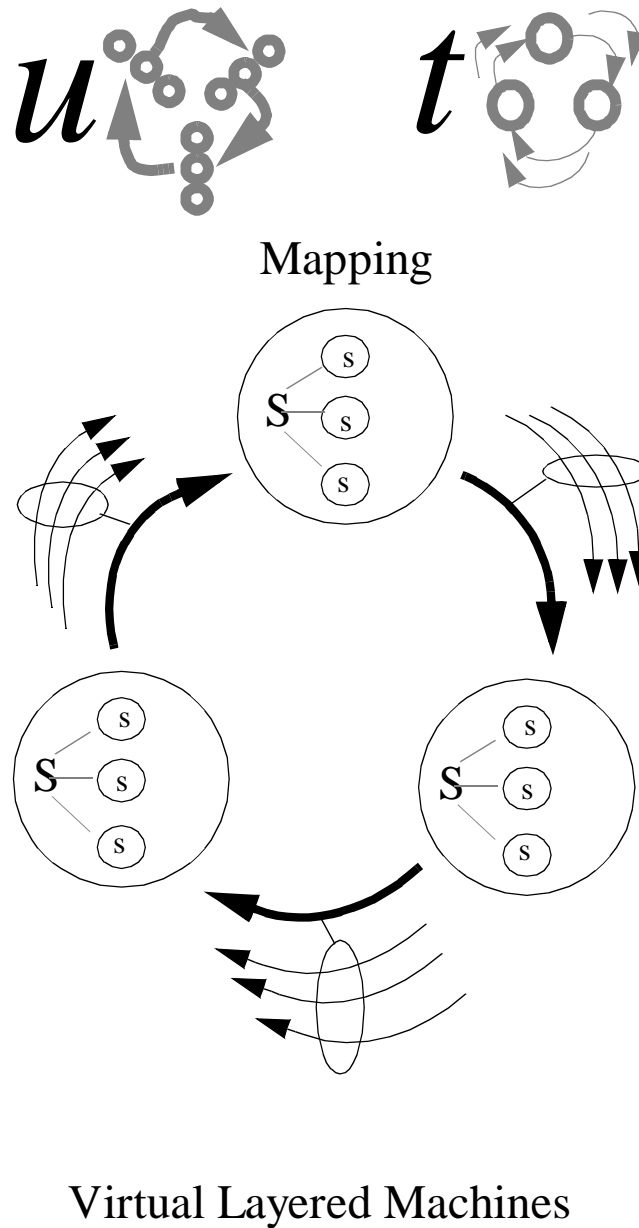


32.1. Correlated variables equals two world lines and their current values

32.2. Information flow equals messages between worldlines

33.  $t$ - $u$  combination = Virtual Layered Machine and mapping

Figure 56:



33.1. When both kinds of state to function mappings are brought together there is complete system mapping

33.2. VLM is the relation between higher level functions and lower level functions.



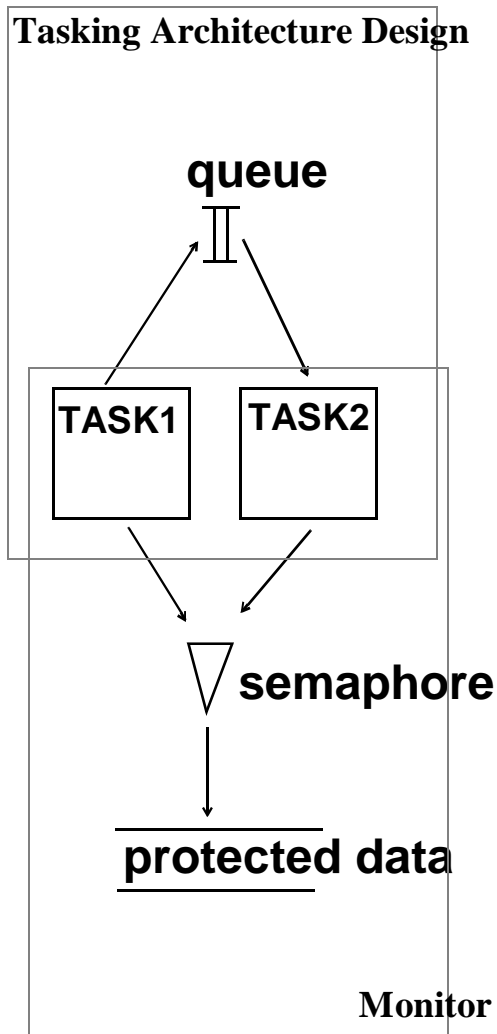
**33.3. VLM is the reation between higher level states and lower level states.**

## Appendix C: Minimal Methods

Figure 57: Darts Minimal Method

**AGENT  
who**

agent views data as data transport mechanism



data views agent via data monitor

**where  
DATA**

Figure 58: Mapping and Virtual Layered Machine Minimal Methods

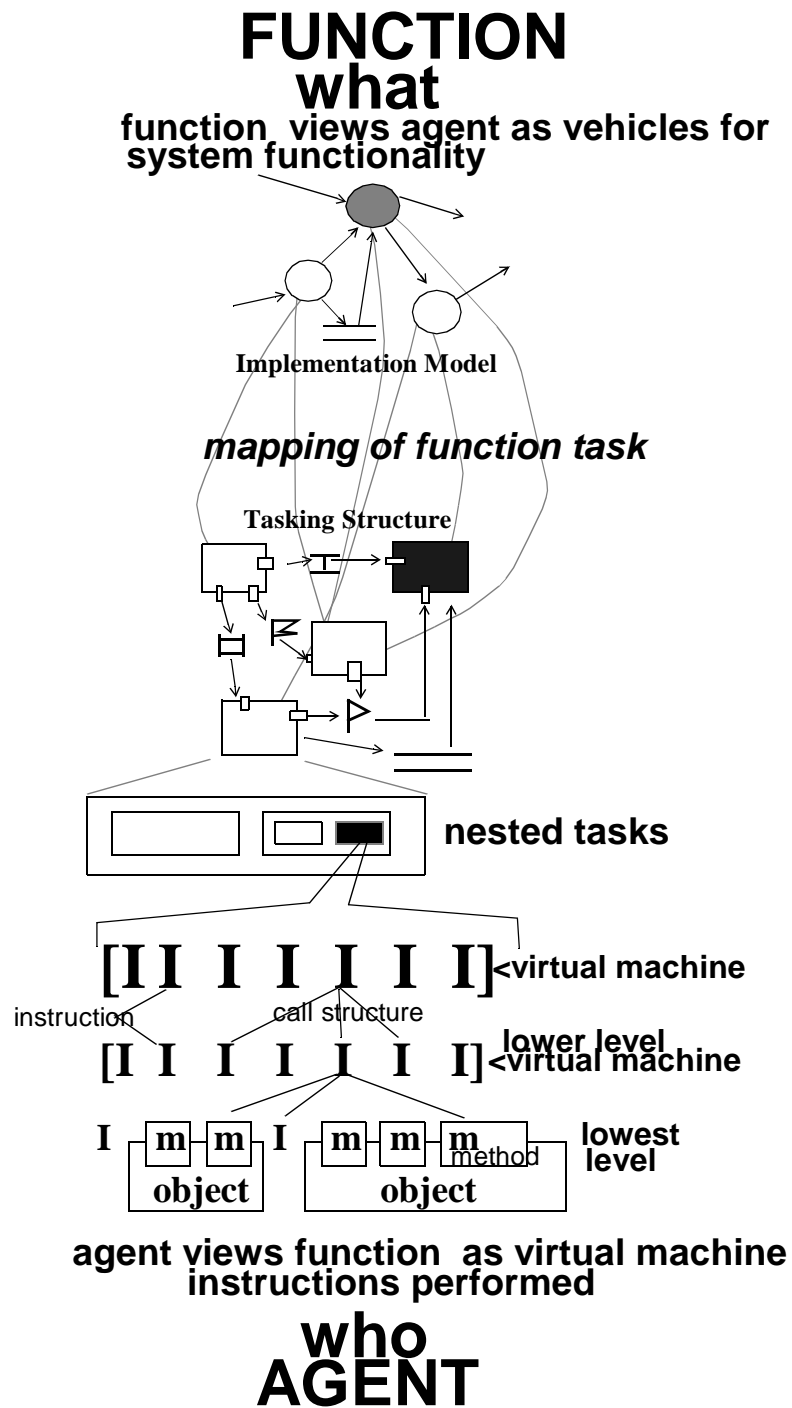
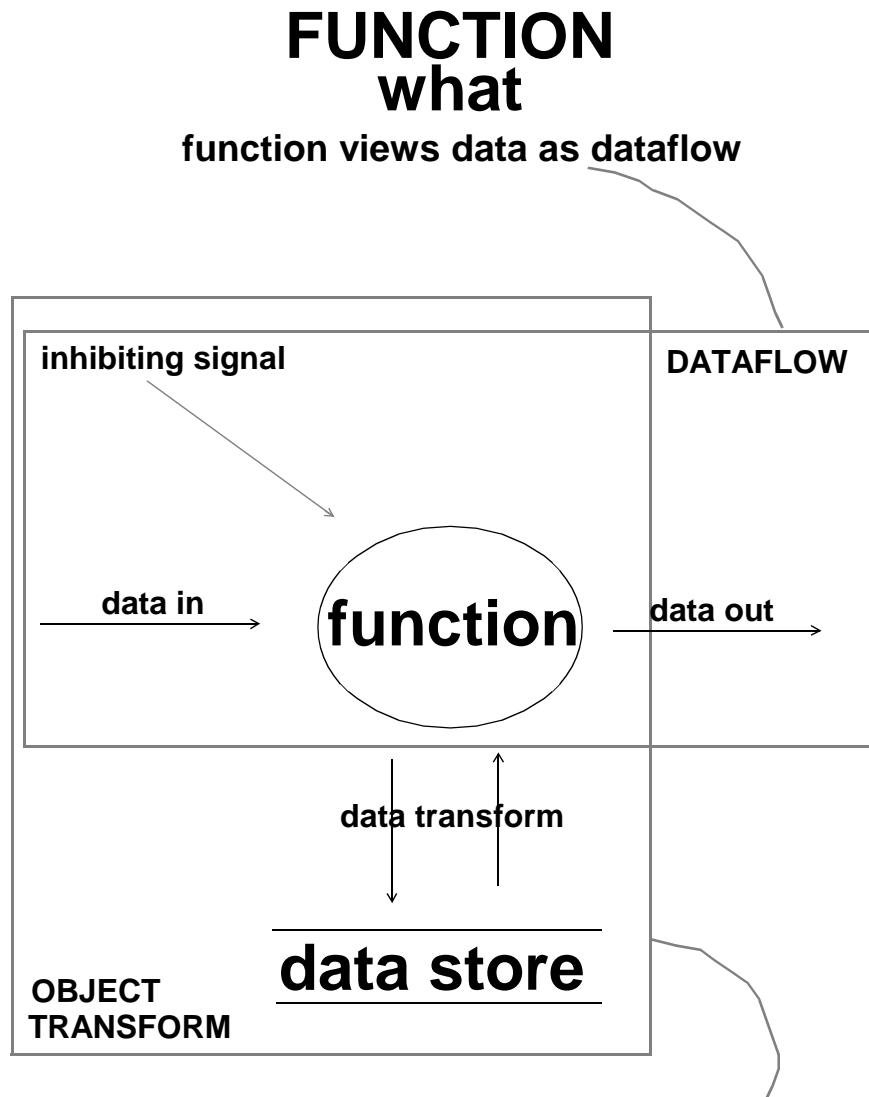


Figure 59: Dataflow Minimal Method



data views function as transforming  
method operating on persistent data

**where**  
**DATA**

Figure 60: Statemachine and Petrinet Minimal Methods

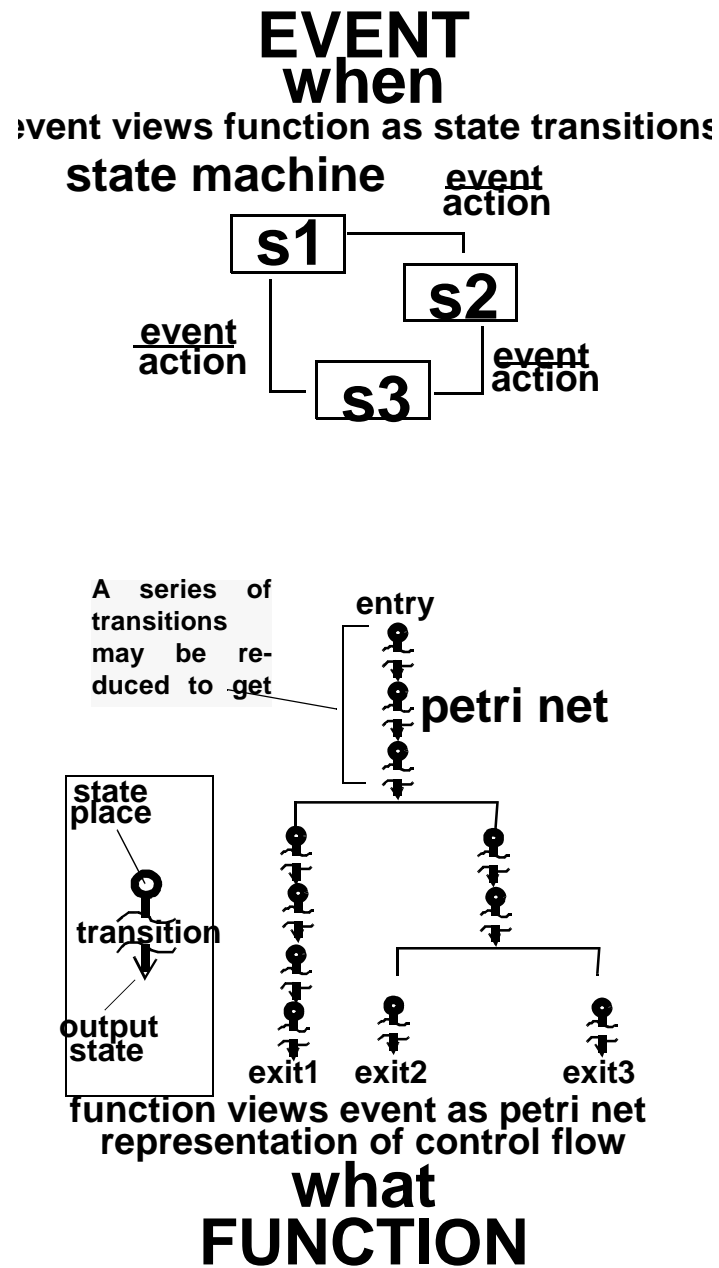
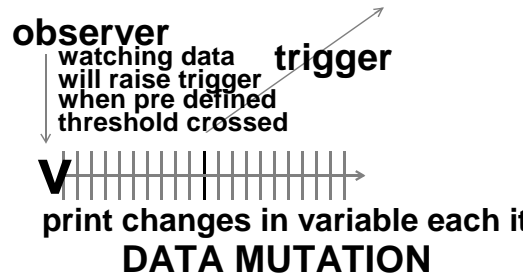
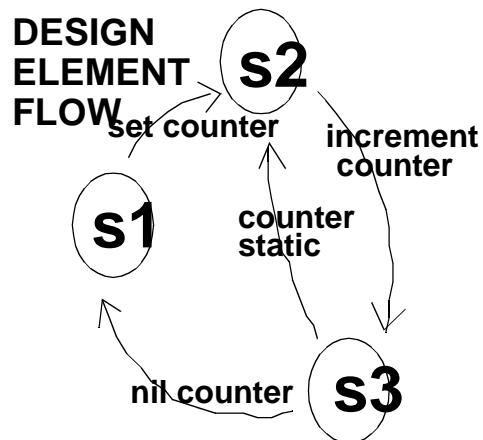


Figure 61: Design Element Flow and Data Mutation Minimal Methods

# EVENT when

digital view

event views data as flowing des

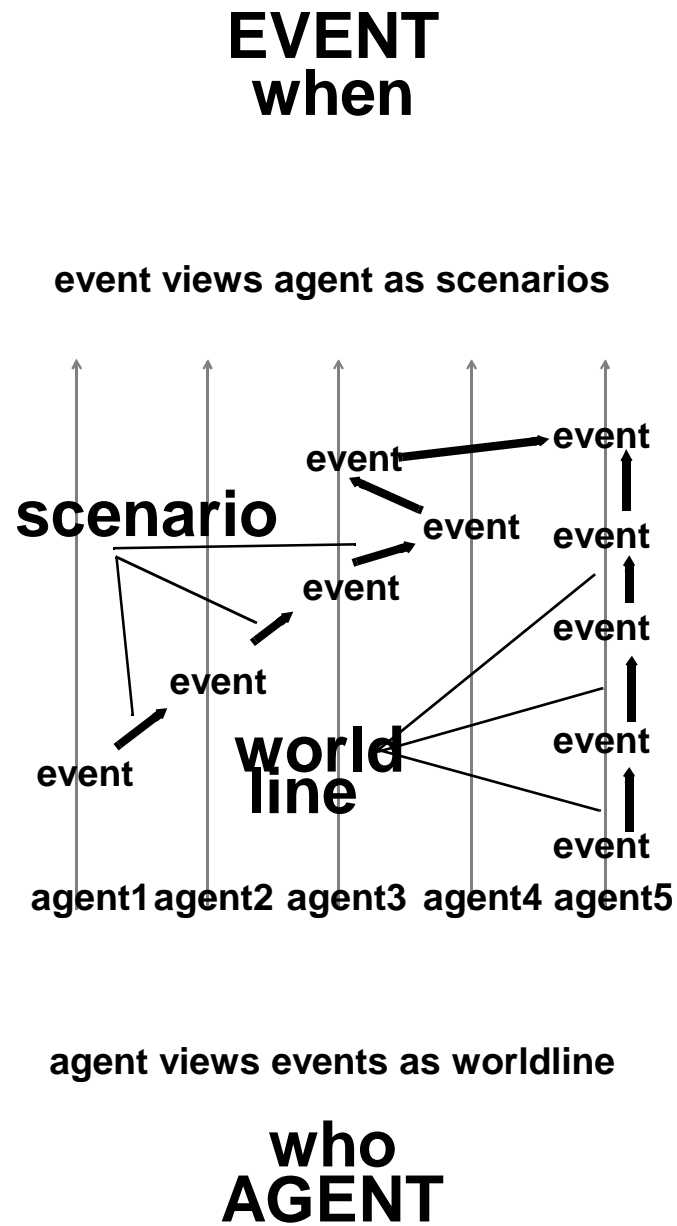


data views event as changes in data val

analog view

# where DATA

Figure 62: Worldlines and Scenario Minimal Methods

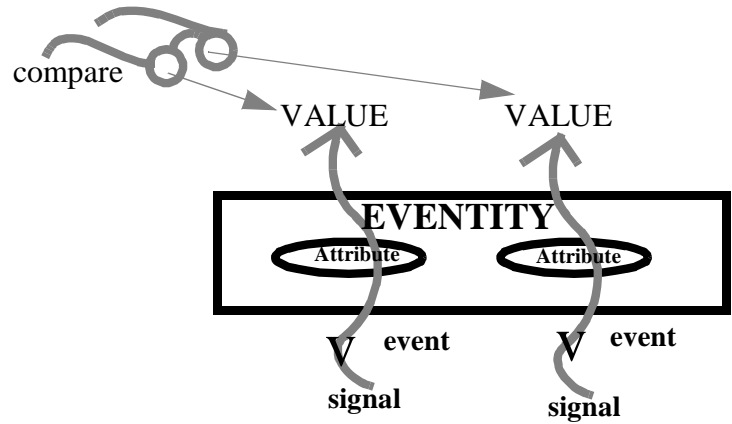
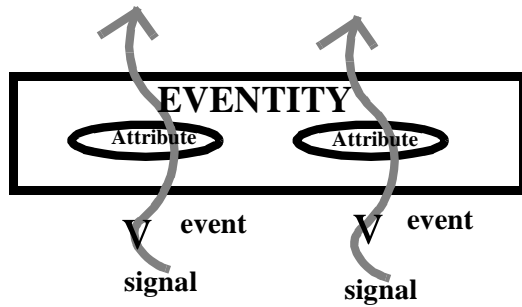






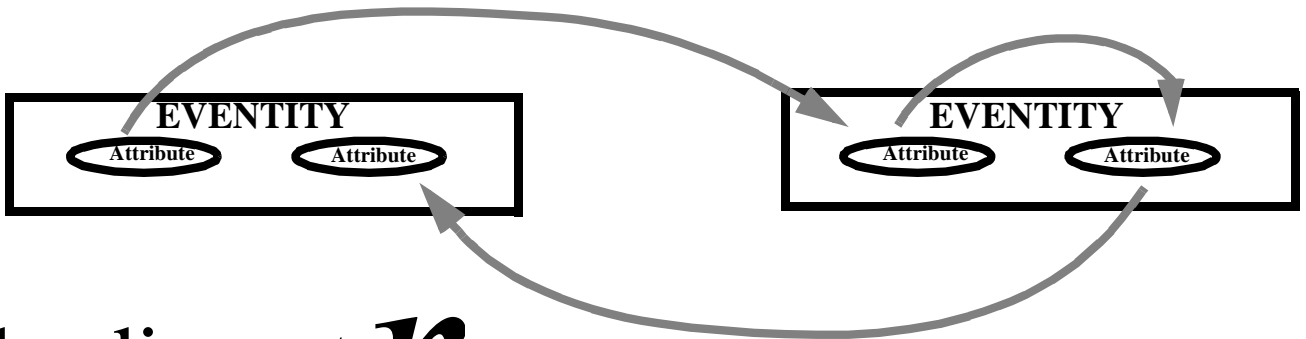


embodiment  $S$



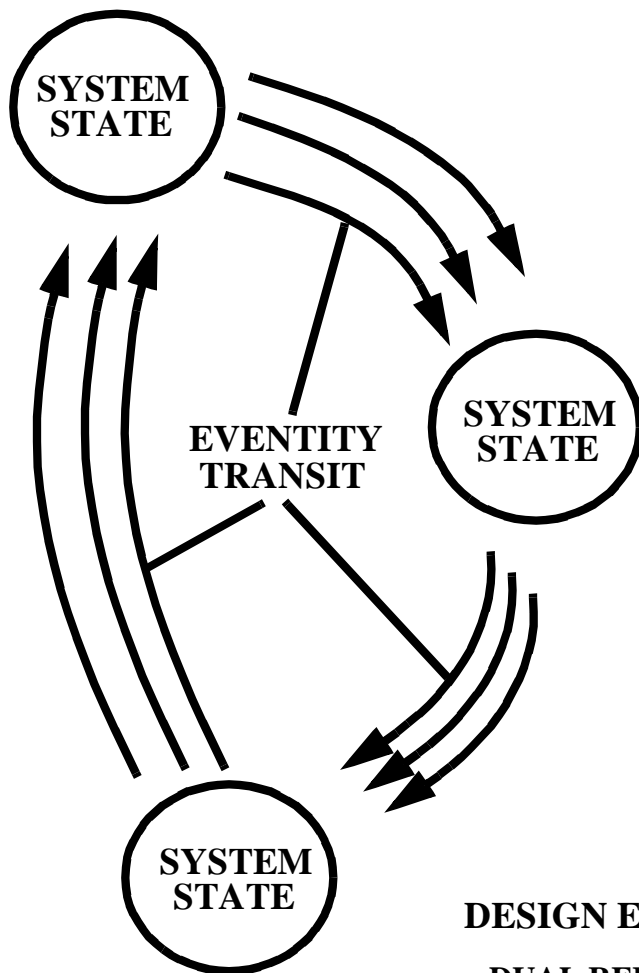
## INFORMATION FLOW DIAGRAM

## INFORMATION NETWORK



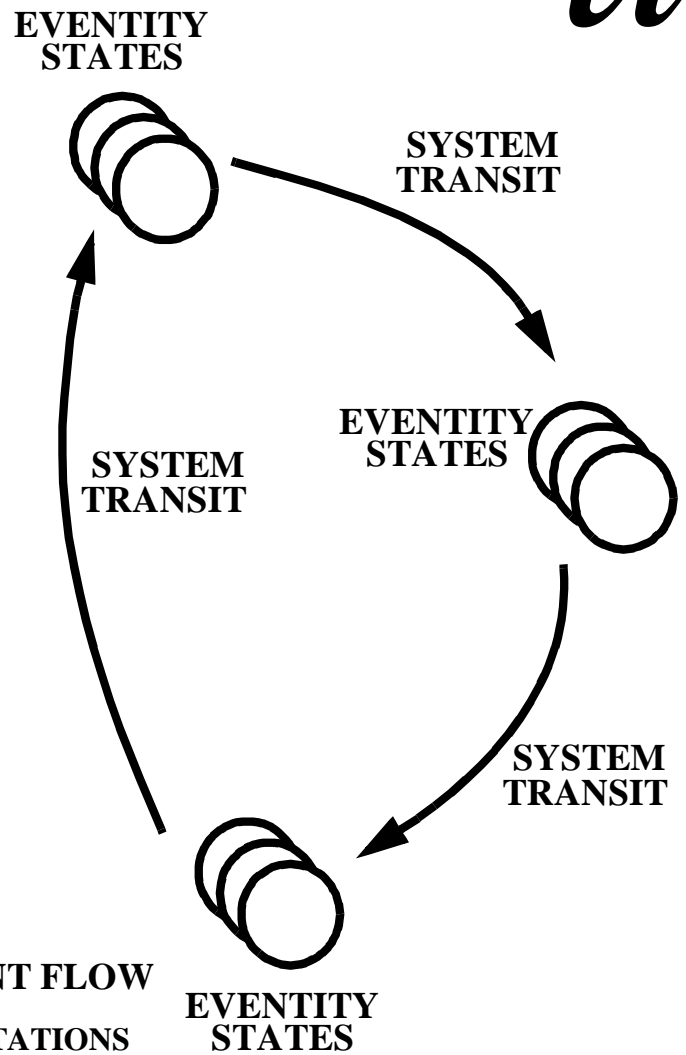
embodiment  $r$

*t* embodiment



DESIGN ELEMENT FLOW  
DUAL REPRESENTATIONS

embodiment *u*



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