

Reflexive Autopoiesis and Weak Measures

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Original 7/16/2003; Version 0.05; 7/22/2003;

wm01a05.doc

Keywords: Weak Measures, Autopoiesis,
Reflexivity

Introduction to Autopoietic Theory

In this paper we will consider the relation between Autopoiesis and Weak Measures. Weak Measurement theory is a new interpretation of Quantum Mechanics developed by Yakir Aharonov. Autopoiesis is the theory of Maturana and Varela which describes living systems. We normally think about Quantum Mechanical systems as operating only on the micro-level and Autopoietic Living systems as operating on the macro-level. So what is the connection between these two theories? You might wonder. The connection is that Autopoietic Systems display many of the qualities of quantum mechanical systems only at the macro-level. This is considered to not be an accident because in reality there is no separation between the micro and macro levels as proposed

by the Copenhagen hypothesis. Our assumption is that the reality is that quantum mechanical effects occur at the macro-level as well as the micro-level. The question then becomes why we do not see them. This is because we project Being onto Existence. Existence is the fabric of quantum reality that permeates everything. Being is something we project onto Existence which gives us the Newtonian picture of the world that we have developed which is mechanical and thermodynamic. Living systems exploit the Quantum Mechanical fabric of our world to produce neg-entropic effects which should be illegal in a purely Newtonian and thermodynamic universe. These negentropic *dissipative structures* were studied by Prigogine. They are well known ordering effects that rebel against entropy locally and establish order against all odds. We prefer to think of these outbursts of negative entropy as updrafts from the quantum mechanical fabric of Existence beneath the projections of Being. We posit that these updrafts reach a series of thresholds in which they intensify and mutate emergently to produce sui generis effects. The first stage is the appearance of dissipative ordering neg-entropic structures. These structures tend to expand and convert their environments into their order. They are not stable. But then there is the second stage where two of these dissipative ordering neg-entropic structures form a symbiotic relation to produce an autopoietic or self-organizing system which is stable. Third there is the further symbiosis of two autopoietic living systems into a reflexive social system. In each of these stages a different set of characteristics emerge but in each case by the conjunction of components from lower emergent levels. In all three

cases the characteristics of the emergent special systems are similar to quantum mechanical systems and appear as local macro-quantum mechanical effects in which Newtonian rules are broken and ultra-efficacious properties become manifest.

Autopoietic systems have been defined by Maturana and Varela as unities which they are at the organizational level. But at the structural level they are composed of a symbiosis of two dissipative structures which produces a stable boundary similar to the way that positive and negative solitons produce a stable breather formation when they fall into each other. The key point is that Autopoietic systems are conjunctions of dissipative ordering structures just as Reflexive systems are conjunctions of autopoietic systems. This conjunction is modeled by hyper complex algebras. Dissipative Ordering special systems are modeled by complexnion algebra, Autopoietic Symbiotic special systems are modeled by quaternion algebra, and Reflexive Social special systems are modeled by octonion algebra. Non-special systems governed by entropy locally as well as globally are related to the real algebra and sedenion non-division algebras which bracket the hyper complex algebras in terms of their order of emergence based on the loss of mathematical properties. This series of algebraic models allows us to explore the nature of the normal and special systems and understand their emergent transformation at each level. Systemic emergent supervening properties are gained as mathematical properties are lost in each case. It is this discovery of a mathematical basis for autopoietic theory that has revolutionized it. It is no longer

merely a series of abstract models applied to understanding living systems. Rather it has become a mathematically structured theory that can be tested against nature and thus refuted or not as Karl Popper would demand. Truly scientific theories need this property which distinguishes a scientific theory from philosophy.

Once we recognize that Autopoietic Living Systems on the macro scale have characteristics similar to quantum mechanical systems on the micro scale then we can extend our analysis of them even further by exploring the similarities and differences from quantum mechanical system. All the ultra-effacacious properties of special systems are related to the strange properties of quantum mechanical systems. In the case of the autopoietic system the ultra-efficacious property is the longevity of the viable autopoietic systems which pops into existence as living, and continues until apoptosis occurs when suddenly dies and discontinuously transitions into death. While it is alive the autopoietic system is a mixture of cognitive and behavioral aspects which cannot be separated. From the outside the autopoietic system is closed to the observer. Given a stimulus the observer cannot predict the response of the autopoietic system, because that response is predicated on an internal hypercycle of states that is unknown to the observer. However, the autopoietic system is simultaneously open to perturbations which traverse its closed boundary. So the autopoietic system is open and closed at the same time, just as it is cognitive and behavioral at the same time. The autopoietic system is an existential picture of the living viable organism distinct from its relation to its species and the essences conferred on it

by evolutionary processes. The closed boundary of the autopoietic system is like the event horizon of the Black Hole in physics. Information goes in but does not come out. No one can see within that boundary as to what is happening internally to the autopoietic system. We can merely observe the behavior of the living system and hypothesize what is happening inside with our theory of mind which is projected onto the autopoietic system by other autopoietic systems within the same social fabric which is characterized by the next emergent level of the reflexive special system. In this paper we will be particularly concerned with this event horizon of the boundary of the autopoietic system which operates like the surface of a Kleinian bottle. Such a bottle is made up of two Mobius strips conjoined topologically. It is confusing whether a Kleinian bottle has an inside or an outside because topologically the inside turns into the outside and vice versa because it is a non-orientable surface. A Kleinian bottle has a circle of self-intersection. This circle has an ambiguous characteristic where you do not know where you are on the surface when you are on this circle. This is like the inherent circular nature of the self-producing system. It is constantly producing new components of itself and then replacing itself with those components as it continues to live based on some preset global organization. Autopoietic systems are not self-designing. They do not exhibit Nietzschean self-overcoming or self-consciousness necessarily. However, they must operationally fold through themselves like a Kleinian bottle does topologically. So the surface of the Kleinian bottle is differentiated. We would similarly expect the surface of the

autopoietic system to be differentiated. It is possible to think of this differentiation using the theory of Deleuze and Guattari developed in Anti-Oedipus and A Thousand Plateaus. Deleuze and Guattari says that the individual organism is differentiated into desiring machines. We can think of these as analogous to the dissipative structures of Prigogine. There is then a seam between the conjoined dissipative structures that symbiotically are conjoined to produce the autopoietic system. For instance, in our body there is the right, left symmetry which extends to the inside of the body, and particularly the brain but manifests in most cases in terms of the placement of organs as well with a few notable exceptions such as the heart, liver etc. According to Deleuze and Guattari the desiring machines arise from the body-without-organs, i.e. the whole body that represents the unconscious functioning of the total organism maintaining its viability. The body-without-organs is one way of looking at the underside of the organization level above the structural level. We see the organization of behavior and cognition over time but that must be based on the maintenance of continuity unconsciously by the body as a whole which seams together and regulates the various desiring machines that operate as a rhizome at the structural level. In order to understand this higher level organization it is necessary to extend the theory of Deleuze and Guattari. We do so by noting that the opposite of desiring is avoiding, and the opposite of these two fundamental activities is dissemination and absorption. Instead of calling these 'machines' in the sense of Deleuze and Guattari which means something prior to the arising of subject and object

distinctions we would like to use the term practice and refer to these four practices as dissipative practices. In other words negentropic order is established at the macro level by desire, avoidance, dissemination, and absorption. These are related in turn to the four kinds of pattern that can appear as the substrate of the organizational level, which is structure, flux, value and sign. Structure relates to discontinuities in space, flux to discontinuities in time, value to discontinuities in use, and sign to discontinuities in signification. If we consider that structure and flux establishes pattern in spacetime, then there is within the event horizon of the autopoietic system the patterning of value and sign which operates as a hyper cycle that controls the autopoietic system. We see the patterning of spacetime by the autopoietic system created by its dissipative practices that we observe as behaviors. But the cognitive side of the autopoietic system is hidden and we do not see the transformations of sign and value that occur behind the scenes that precipitate behaviors. However, we do know that because the autopoietic system is characterized by the quaternionic algebra that it is trapped in a non-commutational regime and that means that any behavior it does cannot be immediately undone by doing the inverse. So we assume that the hypercycles of control are directed to maintain homeostasis in spite of the fact that actions are non-commutating. This necessarily leads to complex invisible patterns of value and sign relations. Values are related to the ready-to-hand grasping and signs are related to present-at-hand pointing if we translate these into the terms that Heidegger uses to describe Dasein. Dasein is a similar idea to that of

the Autopoietic System. Dasein is prior to the arising of the Subject/Object Dichotomy. Similarly the Autopoietic System is prior to the arising of inside and outside. The autopoietic system has to be responsive to its environment especially the food chain. Thus it is maximally open to sensations but maximally closed to information leakage to predators. This is necessary to maintain viability by avoiding becoming someone else's lunch while still finding lunch ones self. So autopoietic systems are open to influence from the outside while giving as little information about itself as possible until it acts physically in the environment. Evolution has powerfully honed the autopoietic system so that its boundary has this special quality of absorption. On the other hand the behavior of the autopoietic system exhibits desire from basic instincts on up to very complex desires such as fetishes. The autopoietic system disseminates information between itself and other autopoietic systems within the reflexive field that Deleuze and Guattari call the *socius*. The autopoietic system practices avoidance of situations which threaten its viability both under threat from other autopoietic systems and other threats in the environment. We have noted that the autopoietic system is a being-in-the-world which has the modalities of present-at-hand and ready-to-hand. It also exhibits the modalities of in-hand of Hyper Being and out-of-hand of Wild Being. The discontinuity between dissipative practices at the pattern level below the organized formal level is an example of the in-hand which is related to bearing according to Levinas. The in-hand level relates to what Derrida calls *differance* of differing and deferring. The in-hand relates to the transformation of

the tool in our hand as we invent other kinds of work that must be done. All discontinuities in the genetic unfolding of the autopoietic system are related to the in-hand. The in-hand signifies expansion of being-in-the-world of Dasein. The out-of-hand of Wild Being is the contraction of being-in-the-world. It relates to propensities, tendencies, and dispositions of the autopoietic system rather than its possibilities which are related to the in-hand. The ready-to-hand is related to probabilities and the present-at-hand are related to determinate continuities. Each autopoietic system has genetic and environmentally conditioned habitus which gives dynamism to the patterning relations of structure, flux, value, and sign.

The archetypal systems images are Language and Games. As such there are meta-levels where the first meta-level is the game, the second is the rules, the third is the pieces and the fourth are the anomalies. In terms of language this series is the language, the grammar, the phonemes, and the anomalies. When Wittgenstein speaks of language games he is combining these two metaphors to produce a powerful meta-metaphor for the system. An autopoietic system is composed of forms and their relations. Beneath forms are patterns, beneath patterns are monads and facets which are lower level schemas caught up in the system. Beyond the system is the meta-system which is thought of as the environment, ecosystem, context, milieu, situation, etc. In the autopoietic system order is being introduced into the forms, patterns, monads and facets of the system. Order is being introduced from two symbiotic dissipative structures in a symbiotic relation that is maintaining the

stability of the boundary of the autopoietic system. This order can be in the form of self-repair and self-maintenance, or in the form of new self-production leading to growth and development of the system. It is from the grammar or rules governing the autopoietic system that it takes its template for self-production. It must produce its own components and then replace old components with new components. The components appear at the third meta-level while the rules appear at the second meta-level. But rules and components must at time conform to exceptions necessary to fit into the environment. Systems fit into meta-system niches like hand into glove or key into lock. So the exceptions allow the autopoietic system to produce unique signatures that help it adapt to its environment more transparently and thus creating more safety for itself. We have to see the autopoietic system operating at each of these meta-levels. What is different is that there is order induction through the two symbiotic dissipative structures which produce the autopoietic system making it different from either the normal system or the meta-system. The autopoietic system is bound into a reflexive field which is based on reproduction and sex which produces families and from them the social nexus of the polis.

Beyond Non-computability

There is an important paper¹ by Letelier, Martin and Mpodozis that compares the MR systems of Rosen with Autopoietic

¹ "Autopoietic and (M,R) systems" Journal of Theoretical Biology 222 (2003) 261-272

Systems and from this analogy it is deduced that Autopoietic Systems are non-computable like MR systems. This is an important result because it means that we will not be simulating Autopoietic systems any time soon. But it also begs the question as to what kind of non-computability is meant. There are many types of non-computability, but two main types is the inability of Turing machines to compute whether they will halt or not. However, there are also systems like universal Turing machines that function as operating systems that never stop, and non-computability means something else in a non-halting environment. Real-time systems may not be able to simulate themselves because any simulation that realizes the same results as the real-time system is merely another version of it. Let us posit that there is a difference of non-computability between Turing machines and universal Turing machines. In other words a Turing machine cannot compute its universal Turing machine and a universal Turing machine cannot compute its Turing machine. A universal Turing machine just halts the Turing machine. The Turing machine simulates the universal Turing machine at some level of abstraction but cannot simulate it completely because it is not a universal Turing machine. But through its simulation it knows how to interact with the universal Turing machine and can respond appropriately to other Turing machines within that environment. Now the question becomes whether there is any other threshold of organization beyond the non-computability that separates the Turing from the universal Turing machine? We posit that the autopoietic living system is just such a threshold. In other words if we cannot compute it we can at least live it which is

a type of bearing and encompassing of experience which results in behavior. In other words living is a threshold of organization beyond the Turing and universal Turing machines computability beyond the threshold of non-computability. This explains why the autopoietic system is between the meta-system as universal Turing machine and the system as Turing machine. These machines are bound within the entropic regime. The autopoietic system breaks free of the entropic machine locally to produce a unique type of non-computational regime which experiences and reacts behaviorally to the environment in such a way to maintain viability. It is an enclosed system due to the capacity of Wild Being for expression through the autopoietic system and it is a bearing system due to the capacity of Hyper Being for expression through the autopoietic system. Behaviorally it expresses an inward pointing and grasping, but outwardly it expresses bearing and encompassing that defines its cognitive characteristics. All the meta-levels of Being are bound together in the autopoietic system in a special configuration. This special configuration allows the autopoietic system maintain its viability through a tight loop of experience and behavior which is never the less non-computable either as an operating system or as an application. Living through is different from computation. Computation always seems empty, as the promise of artificial life, artificial reality, etc. Computation is not experience and behavior hyper-cycle controlled loop of the living system. Computation can never approach the reality of living through as a viable existential organism in our lifeworld on earth. Computation is entropically bound

unless it can make the jump to quantum computation. Living systems are like quantum mechanical information systems that compute across worlds of the pluriverse. The autopoietic system is a special threshold beyond the threshold of non-computability. The dissipative and reflexive special systems are other special sub-thresholds between the autopoietic and the system or the autopoietic and the meta-system. These sub-thresholds give us the phenomena of consciousness and the social theory of mind within the reflexive environment. Consciousness is the human face of the Other within while the Social is the human face of the Other without. The living system encompasses turning computation from within consciousness. The living system bears the universal Turing computation from without the social. It is this production of these special thresholds that produces the Platonic Divided Line. The various lines of the divided line have specific meanings associated with the special systems. Between appearance and sensation there is the line of the outward void that is associated with the reflexive. Between representable and nonrepresentable intelligibles there is the line of the inward emptiness that is associated with the dissipative. Between ratio and doxa there is the major line that is associated with manifestation that is a deeper non-dual beyond emptiness and void. These lines are produced as we step away from computation through the non-computational to the living and then from the living back toward the computational via consciousness and the social. Each of these are emergent thresholds but they are thresholds beyond the two types of computation, those that stop and those that do not stop. Autopoietic systems are non-dual between stopping and non-

stopping computation. Consciousness almost stops and the Social almost does not stop. What neither stops nor does not stop goes on intermittently. It is not continuous nor is it discontinuous. It is not determinate nor is it non-determinate. It is something else other than these dualities which serve to define it negatively. This is why there are dreamless sleep, dreaming sleep, trancelike consciousness, and objective/subjective consciousness. The finitude of our lives revolves around this intermittent going on never quite stopping nor never quite continually going on until the autopoietic spell is broken at death at which point we reenter the determinate world of the entropic. Understanding the nature of the living system as non-dual between the two kinds of computational systems yet beyond them at another level in which living things can become rational and have opinions is a major step forward in understanding how Plato's divided line exemplifies the special systems. Consciousness is empty and the Social is void while life is a form of manifestation which is a deeper non-dual beyond emptiness and void. Buddhists call manifestation tathagata, thusness coming. Muslims call it the Sifat or Attributes of God. Taoists call manifestation the great feminine gate through which all the opposites embodied by things come into existence. What ever we call it we get to it first by identifying emptiness as the non-dual via the tetralemma, and then saying not emptiness and not form and not everything else. The contradictions of the autopoietic system come from the fact that it attempts to approximate this deeper non-dual as a level of interpenetration which has a certain perfection beyond perfection and

imperfection. In other words perfection and imperfection is a duality to which we must say not perfect and not imperfect. But that non-dual is more perfect than the perfect and more non-perfect than the non-perfect. It is flawed in its perfection and perfect in its flaws yet it maintains the difference between perfect and imperfect. That is life, it is knowledge, it is light, it is the difference between inward and outward. Autopoiesis approaches this threshold of manifestation beyond emptiness and void. In doing so it goes beyond the thresholds of empty consciousness and void sociality which are attempts to reapproach the computational thresholds of the Turing and universal Turing machines which stop or do not stop as the case may be. Understanding this gives real depth to autopoietic theory and its relation to the theory of dissipative structures and reflexive social systems. From them comes the divisions of the divided line of Plato. From them comes the difference between the non-duals of emptiness and void and the distinction between them and the deeper non-dual of manifestation. This places autopoietic theory at the heart of our tradition through the works of Plato and places the question of emptiness and void as non-excludable middles at the heart of that tradition. At the center of our tradition is the difference between emptiness and void and they become expressed as consciousness and the social when we place a human face on them from the point of view of the living system as viable organism which expresses manifestation which is the deepest non-dual.

Non-dualities Emerging

Something should be said about how the non-duals emerge in the Western worldview. We noted that there is a relation between the autopoietic system and dasein. The key similarity is finitude. Dasein ecstatically projects a world from out of its finitude. In this sense it is a being that projects Being onto beings. Dasein is the place at which Being loops the loop or self-intersects. Similarly the autopoietic system is projecting organization on itself, on its own structural substrate. Organizing itself is the inverse of organizing the world. In some sense dasein and the autopoietic system are inverses of each other. Dasein organizes the world as a plenum of Being which includes myriad beings including those like itself that project Being ecstatically. It is in this ecstatic projection that Heidegger discovers the existentiality of dasein. The autopoietic system reduces the organism to a machine that self-produces and thus organizes itself. It also is a model of existentiality as opposed to the fascination with the essence building of evolution based on species production. Autopoiesis only cares about the viability of the existential organism without regard to its species. If you replace the word Being with Life then the autopoietic system is the place where life folds though itself, where it self-produces and reproduces itself. Ontological difference for Heidegger is the difference between beings and Being. There is a similar difference between organization and structure in Autopoietic theory. Organization is the hallmark of life while structure is made up of the components that make up life below the threshold of the living. Both the Autopoietic system and dasein are prior to the arising of the subject/object dichotomy. This appears

with respect to the autopoietic system is the difference between observers and the subjectivity of the system itself which is hidden. Observers can only see the external behavior of the autopoietic system but cannot infer the cognitive functioning of that system from the stimulus and response regimes. This defines the closure of the autopoietic system. But the autopoietic system itself is both observer and subject and as an existential projector of organization it is prior to the distinction of subject and object observed. Dasein on the other hand projects the realm of Being that is necessary for the difference between subject and object to be drawn. Being comes first before beings can be sorted out as Subjects or Objects. As Nietzsche says Objects are Subjects turned inside out and vice versa. In this sense this is a false distinction that only arises in Pure Being which is static. In Process Being we lose the present-at-hand separation that allows subjects to point at objects and instead we get tool being, ready-to-hand, which is something hidden beneath the difference between subjects and objects. We noted before that inside the autopoietic system are value (grasping) and signs (pointing). So these modalities of being-in-the-world are implicit in the autopoietic system. What is interesting is that we have discovered that the bearing (in-hand) and encompassing (out-of-hand) define the autopoietic system from the outside. These modalities are deeper levels of the genealogy of the subject which derives from dasein, which in turn derives from the query (in-hand) and the enigma (out-of-hand). The query asks who dasein the ecstatic projector of questioning *is* at the level of Hyper Being. The enigma comes prior to the unfolding of questioning. The Sphinx

asks Oedipus her riddle the answer to which is himself, the man who grows old having put out his own eyes and achieved inner sight. Oedipus questions who he is himself without realizing it. He is the one who has killed his father and married his mother. The enigma centers around his fate beyond the questioning of it by himself. Churchill talking about Russia's possible actions in 1939 said "It is a riddle wrapped in a mystery inside an enigma." This expresses the nature of the enigma in as much as the sphinx's riddle refers to man, but Oedipus is a particular man with a particular fate. Oedipus is the one who is the source of the plague on his polis. It is a mystery who is the cause of the plague. So Oedipus starts out to discover killer of Laius. As he gets closer and closer to the answer to the mystery he comes closer and closer to realizing his own fate. But why he has this fate is an enigma. It has nothing to do with him yet everything to do with who he *is* in relation to Wild Being.

Once we understand that the projection of self-organization is the inverse of the projection of the world and so that dasein and the autopoietic system are complementary, then we can consider how the autopoietic system can function as the basis of the projections of Being by dasein. The dasein must be a viable living organism first before the world is projected that gives Being to all beings including the projector himself. This means that there must be a complementarity between the non-duals expressed in the differentiation of the world and the inner environment of the autopoietic system that establishes the viability of the living system that supports the projection of Being. Now the world that dasein projects ecstaticly

unfolds from manifestation which is its root. There are a series of dualities that are projected which are nihilistic opposites. These are manifest/- (*root*) - /non-manifest, actualization/- (*source*) - /non-actualization, existing/- (*fate*) -/non-existing, having/- (*good*) -/not-having, finite/- (*right*) -/infinite, logos/- (*order*) - /physus, physics/- (*info-energy*) - /thermodynamics, quantum-mechanics/- (*spacetime*) -/relativity, particle/- (*indeterminacy*) -/wave. Here the middle term is the non-dual in each case between and before the the arising of each dual. The non-dual is the secret connection between the nihilistic opposites. This secret connection is necessary as a basis for making the extreme nihilistic distinction in each case. Dasein projects the dualism in the current metaphysical era. But all projections of Being are made on the basis of Existence. The non-duals point toward Existence. Existence gets differentiated based on the projected dualities which is different in each case. Because the subject, dasein, query and enigma are all descriptions of the self at various levels of Being they do not describe the basis in existence articulated as the non-duals. Existence can be described in terms of emptiness and void. These two descriptions are both non-dual and manifestation is the deeper non-dual between them. It is the autopoietic system as inward, outward, living, knowing, light, subtle, etc which approximates manifestation. The non-manifest is what is empty or void. These are both aspects of the single source of causation known as the root. From the root appears the sources, known as the Platonic Forms, or source forms. What is actualized or not actualized from those sources provide the scope of existence, i.e. what is found. Among the

actualizations what is found to exist is what is fated. Fate separates the existing from the non-existing. Among the things found there are the various goods that may be possessed or not. Each of us needs different things and thus what is good for one is bad for someone else. Our desires connect to the various goods and determine what things we strive for in our lives. In our striving we judge what is right in terms of amount between the finite and the infinite. In terms of finitude there is both physus and logos were the non-dual between them is order. In terms of physus there is either physics or thermodynamics and info-energy is defined between them along with their opposites which are entropy and matter. There is negative information, negative energy, anti-matter and negative entropy. These four and their opposites give us an interesting kernel of distinctions that allow us to define the autopoietic system. Autopoietic systems are negatively entropic locally within a global entropy gradient. Autopoietic systems are locally centers of negative information within a global positive information gradient. Autopoietic systems have a material substrate where the annihilation with anti-matter has already taken place. Autopoietic systems positively energetic where negative energy has not occurred. So it is negative entropy and negative information that are the keys to understanding autopoietic systems. The negative information occurs because the autopoietic system is like a black hole sucking up information from the environment. This information is turned into an ordering that is projected back out onto the system itself. The system is made up of matter which forms components that participate in the energy exchanges that produce the far from

equilibrium status of the autopoietic system as a conjunction of dissipative structures. This energy that is exchanged never goes negative. So in terms of energy and matter the system remains positive. But in terms of entropy and energy the system goes negative and that is how it produces its anomalous features. The autopoietic system is not a perpetual motion machine, but it is in fact a perpetual information machine which adds to that conversion from positive to negative information neg-entropic ordering locally within a globally entropic environment. It is on the basis of the living viability of the autopoietic system which lives though the experiences and reacts to its environment behaviorally due to its non-commutating nature of its hyper-algebraic structure that allows it to form the basis of dasein's projection of Being to produce a world. Existence and Being are complementary and can only operate on the basis of each other. Dasein projects Being in the world and characterizes itself as subject, dasein, query, enigma or empty/void self. But the autopoietic system as viable living existent is the necessary substrate for this activity. That necessary substrate is rooted in manifestation which is deeper than the fatedness of existence and even deeper than actualization from sources. The single source of all causation is the root that distinguishes what is manifest from the unmanifest, which becomes actualized and eventually is found to exist as empty or void.

The world tree of dualities with their non-duals is projected by dasein, which discovers itself to be a query, an enigma, an empty or void self. Those non-dualities point back to the existence of

the autopoietic system, its actualization and ultimately its manifestation. The back pointing toward existence and manifestation is based on the projection outward of the dualities. With no differentiating projection there would be no backpointing. In that case there would only be pure manifestation itself, i.e. the perfection beyond perfection and imperfection, i.e. life itself, knowledge itself, light itself, inward itself, outward itself. The world tree grows from the seed of the autopoietic system at the root of dasein's projections. As the world tree is projected outward it progressively approaches the quantum mechanical limit. This is because the autopoietic system is an image of the quantum mechanical at the macro level. It brings the effects of quantum mechanical systems discovered as occurring between energy and matter out at the macro level as the effects between negative information and negative entropy. As physics is explored more and more deeply thorough physics and thermodynamics revealing info-energy we discover negative entropy and negative information as the basis for the ultra-efficacy of the autopoietic system. What is discovered at the micro level as the quantum mechanical nature of positive energy-matter appears at the macro level as the nature of negative entropy and negative information. Non-duality appears in the world tree as a pointer back to existence which in turn points back to actualization from sources and manifestation of the root of causation which has a single source. The autopoietic system provides the pointer to emptiness/void and to manifestation that underlies the projections of Being. This pointer brings us to recognize the divided line of Plato as the emanation of the special systems at the heart of his

philosophy between the analogies of the sun and the cave that are indicators of the Good. In the myth of Er the indicator of fate is the rainbow that occupies the central position in the barzak between karmic incarnations. We talk about autopoietic systems as self-ordering. But it goes deeper than that. They also establish a boundary which is just right between finitude and infinitude. They also determine what is good for them in their environment that supports their viability. They also carry a fate of genetic inheritance and specific location in their environment given their parental placement in society. They are actualizations of the source form of their species. They are exemplifications of the single root of causation which determines everything and as Anaximander says *Out of the boundless existing things are formed as well as destroyed, "according to what must needs be; for they make amends and give reparations to one another for their offense, according to the ordinance of time²"* Autopoietic systems because they describe life and its oddity, knowledge and its oddity, light and its oddity, inward and its oddity, outward and its oddity, etc points to the non-dual depths of existence and beyond that to the depths of manifestation called by the Buddhists the Tathagata, the thussness coming which in Islam is given a more detailed exposition as the tajalliat or manifestation of the attributes (sifat) of God.

There is a kind of back propagation against existence by the projection of Being which gives existence as a non-dual a characterization at each level of

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http://admin.vmi.edu/IR/history_systems/Anaximander_more.htm

the world tree as one of the non-duals. This back propagation is an interesting effect which gives us the difficulty of measuring quantum systems, but also appears in our attempts to measure certain macro-systems based on the special systems, i.e. living systems, consciousness, and the social. Each of these systems are changed by the act of measurement. But they also change the measurement device in the process of measurement. That means there is some small degree of the in-hand modality that appears in the measurement process with respect to these phenomena, which we ourselves exemplify. All the levels of being are revealed in measurement of ourselves and systems like ourselves based on the special systems. This is because the special systems exemplify emergence. They are static standing waves of emergence. Touching them touches the deepest part of ourselves. When we measure special systems phenomena we are in a sense taking a measurement of ourselves. The whole world synthesizes into a face of the world that combines all the different kinds of Being into a single synthesis.

Models Of Paradox And Supra-rationality Circling Around The Autopoietic System

We have made a strong claim that autopoietic systems in their non-computability approach not just emptiness or void but manifestation which is a deeper non-dual between emptiness and void. Emptiness is the key nature of consciousness and Void is the key nature of natural phenomena including the social, i.e. the natural phenomena of Others with whom we

communicate and to whom we are related, as well as those we are not related to and with whom we do not communicate. Emptiness is the human face of the Other inwardly and Void is the human face of the Other outwardly. Emptiness and void and their duality come down to the difference between inside and outside, a difference which is the essence of manifestation, along with the living, the knowing, light, etc which are attributes of God. The Buddhist called this “thusness coming” or suchness. It is described in the Awakening of Faith as the tathagata gharba, the womb of thus come. We get to it by first identifying emptiness as what is pointed to by the four statements, i.e. A , $\sim A$, both, neither called the tetralemma. Once we identify emptiness then it is realized that *form is emptiness* and *emptiness is form* as the Heart sutra tells us. Nagarjuna’s contribution was to show that logic itself points at emptiness via the tetralemma. The tetralemma is equivalent to the Boolean *or*, *and*, *nor*, *nand*. The tetralemma points to the center of this tetrahedron of logical operators and says that emptiness is something different from all four of them, but some topic that is delimited by them together. Aristotle in his metaphysics specifically constructs the law of excluded middle and its complement, non-contradiction, to deny the tetralemma. Aristotle points out that if you say all the statements at once it is non-sense. But the Buddhists do not say them all at once, but only as appropriate in the conversation, understanding that ultimately they amount to silence. But not the silence of ignorance, rather the silence of wisdom. The silence of consciousness and the silence of nature including the bodies of other are different

types of silence. My silence is not the same as your silence. My silence can be empty while your silence can be void. But this difference between silence overwhelming us from the inside or outside points to the question of the nature of the inside and outside which is the question of the deeper non-dual manifestation. What is the difference between inside and outside? If we follow our analogy of the Kleinian Bottle we can see that there are topological surfaces where we cannot tell the difference globally even though we can tell the difference locally. Such surfaces have a crucial difference in them, the circle of self intersection. It is a difference that makes a difference that is internally generated. The autopoietic system has such a boundary which we have identified with the event horizon of the black hole. At the event horizon we escape from the laws of physics that governs our universe. Some like Smolin say that blackholes are the threshold of other universes. In other words they are the interface between the universes that make up the pluriverse. But even blackholes give off energy and perhaps evaporate eventually because in space particles are created and destroyed of the pair one may fall into the black hole while the other one escapes, thus causing some radiation of energy-matter from the black hole generated out of spacetime itself which seems to stop at the event horizon. The autopoietic system is a similar idea to the blackhole but posited at the center of biology as being the existential nature of the individual disregarding its role in evolution as part of the species. It should be noted that our theory of the Kleinian bottle as the topological boundary of the autopoietic system can be augmented in the case of

the conjunction of two autopoietic systems into a reflexive system. There is a formation called a Hyper-Kleinian bottle in which instead of twisting a figure 8 tube and joining it to itself, one rather twists a clover leaf shaped tube and join it to itself. This is equivalent to the conjunction of two autopoietic systems as a dual Kleinian bottle with the same self-intersection circle. Thus it not only becomes ambiguous which surface one is part of within the bottle at that interface but also which bottle one is part of. Self/Other distinctions become ambiguous at that point. This self/Other ambiguity intensifies the inside/outside ambiguity locally while globally one recognizes the difference between self and other or inward and outward. You can see that the special systems on the analogy of the Kleinian Bottle and the Hyper-Kleinian Bottle increase the intensity of the ambiguity that points to manifestation. What is inside the bottle is empty and what is outside the bottle is void. What is inside one bottle is empty and what is in another bottle is void. My emptiness is your void and your void is my emptiness. Emptinesses mingle and Voids mingle in the Hyper Kleinian topology. Ultimately we can think of higher and higher order intensifications of this ambiguity, but that comes about only by increasing the number of others by adding other Kleinian bottles to the formation. We never actually go beyond the self/other ambiguity by increasing the number of others. This means that logically there are only three surfaces of interest, the mobius strip equal to the Penrose/Escher triangle, the Kleinian bottle equal to the paradox of the anamorphic³ perception of the old

³ See Donald Kunze Boundary Logic
<http://art3idea.ce.psu.edu/boundaries/mainpage/direct>

woman and the young girl, the hyper-Kleinian bottle equal to the paradox of the four dimensional tesseract. Each paradox is related intrinsically to a supra-rational topology. The penrose triangle and Escher waterfall is the image of the perpetual motion machine which is impossible. But what is possible is the perpetual information machine as shown by the existence of strange attractors that contain infinite information. When we connect the negative information with the negative entropy we discover that it is not necessary to subvert the energy-mass conservation on the macro scale to produce the special systems. Rather we merely need to construct a surface that distinguishes positive from negative information, where the positive information is outside and the negative information is inside, because the autopoietic system is like a blackhole to information. That is why the observer cannot tell what the autopoietic system is going to do based on stimulus response causality reasoning. Negative information is ignorance, it is non-computability, it is not knowing where the autopoietic system is in the hypercycles that keep multiple variables in homeostasis at once. The autopoietic system is not computing, it is producing a least energy balancing act of various simultaneous homeostatic surfaces. It is bearing the changes in the environment and concentrating on its balancing act. It does so from the vantage point of its encompassing of value and sign inwardly and and its expression of flux and structure outwardly via its behavior of its components. Negative entropy as we know is an influx of order. Order is the creation of information, the creation of surprise. But we have seen that Order is

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a non-dual between physis and logos. Within the autopoietic system is the source of the unfolding of logos while its outside is the source of the unfolding of physis. However, we can step down to the next deeper level and consider the relation of the autopoietic system to the dichotomy between finite and infinite. The autopoietic system is finite but the information is infinite due to its containing of a strange attractor that governs its hypercycle. The autopoietic system establishes its boundary as a non-nihilistic distinction at just the right place between finitude and infinitude. It is continually recognizing itself and differentiating itself from the other. Auto-immune diseases are an example of when this goes haywire. This establishing itself as what is right, just right. Not as a closed finitude of just an open or closed system, or the infinitude of a meta-system, but somewhere between the two as partial system and partial meta-system is the next deeper level of non-duality. Beyond that we see that the autopoietic system must establish itself in terms of what it has and what it does not have, what it desires and what it does not desire, what it avoids and what it does not avoid, what it disseminates and what it does not disseminate, what it absorbs and what it does not absorb. It must distinguish what is good for it based on its own propensities. That goodness and its necessity are the basis of determining viability. The goal of the autopoietic system is to remain viable. But viability is different for each autopoietic system as an individual based on genetic and learned environmental factors. What one autopoietic system can bear another cannot. If the autopoietic system cannot bear a certain situation it becomes encompassed by it and its viability is

compromised. If we go down another level we see that the decision as to whether an autopoietic system is viable leads to the decision as to whether it exists or not, i.e. to the consideration of fate and destiny. Each autopoietic system arrives at a particular point in spacetime, to particular parents, and is confronted by particular challenges. Are the cards stacked against it from the beginning? If they are then we consider that fate. Each autopoietic system works out its own fate in its own way, if only by deciding how to spend its accursed share of spare energy within the meta-system that it participates in. Beyond the level of fate the autopoietic system has a source, what Plato calls a source form, or what we call a source schema. Plato's forms are "self by self beings" in other words the sources beyond spacetime are themselves images of autopoiesis, because they are self-producing in their Being. Each Form is independent and separated from all other Forms, yet strangely they participate in each other. The separation is like the separation between positions in complex spaces. Their mutual participation is like the interpenetration that the hyper complex algebras model. In other words the autopoietic system in spacetime is an image of autopoietic like ideas outside spacetime that are its sources. In fact, we can see that the cognitive aspect of the autopoietic system uses these ideas as a basis for constructing knowledge inwardly and that is what makes the autopoietic system able to persist because there is nothing more persistent than knowledge in our experience. The unfolding of the autopoietic system is called autogenesis. In autogenesis the autopoietic system transitions from its source template, like the object template in object oriented programming, through

its point of origin, to roam around in the arena of the meta-system. The meta-system has boundary which the boundary of the autopoietic system is part of in each case. If we go down another level we find that the autopoietic system may be seen to negotiate the difference between manifestation and the non-manifest. Manifestation as we have defined it is like the tathagata gharba, i.e. suchness which can mirror the attributes of God. Manifestation is the deeper non-dual between emptiness and void. It is the difference between inward and outward. It is the answer to the question concerning that which is: not form, not emptiness. The autopoietic system is an approximation of the living as an attribute of God. As an approximation it dies when apoptosis occurs. Then it is brought back again through the action of the emergent meta-system. Things arise from the void, return to the void and arise again in a karmic cycle of eternal return. The Hinayana ideal of nirvana is to escape this cycle oneself. The Mahayana ideal is to help all beings escape this cycle and to vow to be the last to escape it after all other sentient beings escape it. Thus the cessation of the karmic return of the self and the universe become the same point. That which is not born and does not die is the manifestation of the tathagata. All existents arise from sources, move about within the arena of the meta-system and then return to their sources. This meta-system itself goes on without arising or returning. We can identify with that which arises and returns or we can identify with that which lasts beyond our arising and returning. We are equally system and meta-system. We could talk about the dissipative partial meta-system, the autopoietic partial meta-system, the

reflexive partial meta-system instead of always referring to the system. If we did so we would change our focus toward manifestation. The autopoietic partial system, partial meta-system is the interface between system and meta-system that has special properties of producing supra-rationality. We saw that when we distinguished the perpetual information machine from the perpetual motion machine. But we could go on to distinguish the Kleinian bottle from the anamorph. The Kleinian bottle takes us from the ambiguity of sides of the mobius strip which are locally two but globally one, to the ambiguity of inward and outward on a nonorientable boundless surface. But the perceptual illusion, or paradox associated with this supra-rationality is the anamorph, which is paradoxically two things at once but you can only see one of them at a time. Donald Kunze shows how our culture produces anamorphs in various literary and film contexts. We produce anamorphs because they resolve paradoxes of the mixtures of dualities that we project in our worldview. The dualities that are resolved by the stable amamorphic formation stands in front of the supra-rationality hidden by the autopoietic system. Supra-rationality means two things true at the same time without interfering or contradiction. This is the opposite of the mixture of paradoxicality. The anamorph produces a paradox embodying image that resolves the nihilism that is produced by our culture. But the truth behind the anamorph is that there is separation without interference. This is the difference between the form is emptiness emptiness is form position and the form is form and emptiness is emptiness position. Form is emptiness and

emptiness is form is an anamorph while form is form and emptiness is emptiness is supra-rational. The non-dual between these is manifestation of the thusness or suchness. We see the autopoietic system outwardly as the anamorph but inwardly it is supra-rational. We see the paradoxicality of say Dylan Thomas's poetry where he mixes imagery of sex and death alluding to the Shivan/Dionysian undercurrents of life. But balancing that is the Brahma/Appolloian projection of Being (Sat) which slays the dragon of existence (Python/Typhoon). Projection out and returning to dissolution are two sides of the same coin. But the non-dual between them is Vishnu, who we see images of in the Chinese Hun Tun and Blake's Albion. Vishnu is the image of manifestation in Being -- the sleeper who dreams the world. The autopoietic has within it the ordering and creative principle of Brhama/Apollo but outwardly shows us the image of Shiva/Dionysus. But the surface itself which differentiates locally between inward and outward in spite of not distinguishing between them globally has the nature of Vishnu. Vishnu is related to the root of Being *Bheu, which is encased in the enframming of *Es/*Er//*Bheu//*Wes/*Wer/. The fragmented roots of Being have a structure and that structure indicates the difference between the surface of the Kleinian Bottle and the contingent inside and outside. There is the inside/outside and there is the local/global distinction that together produce the ambiguity. Then there is the self-intersection of the surface which also produces ambiguity. The surface itself mediates between these two sources of ambiguity, i.e. towards self and otherness. This mediation points toward the non-dual of manifestation

beyond the surface level non-duals of emptiness and void. Manifestation is not emptiness and not void, not form, not system, not pattern, not any schema and not inward and not outward, but inward living outwardly and outward living inwardly. We can go on to think about the relation of the hyper Kleinian bottle to the tesseract. The tesseract is a four dimensional figure that we can only see shadows of in their dimension. The hyper-Kleinian bottle melds inward and outward and also self and other. It intensifies the ambiguity of the self/other intersection circle. This in turn intensifies the ambiguity of void and emptiness since my emptiness is your void and vice versa. This intensification of ambiguity is a hyper-paradox. Suddenly it is the topology that is paradoxical and that means that the analogy becomes supra-rational. There is a flip between representations of paradox and supra-rationality. The tesseract is our entry into the fourth dimension. The fourth dimension has some very interesting and unique features. The fourth dimension is the nature of the emptiness of consciousness and the void of nature including other bodies with minds like our own that we project theory of mind onto through our analogy of our own experience of mind. In the fourth dimension all knots untie. In the fourth dimension there are four three dimensional spaces related to each other via quaternionic rotations. The tesseract and its dual the 16 cell polytope produce a lattice that encompasses all of four dimensional space and relate the various three dimensional spaces to each other. The intersection of these two lattices is the 24 cell polytope lattice which is unique to four dimensional space and which is made up of octahedrons and

thus has a special non-blocking quality that only octahedrons possess when arrows are applied to their lines. This non-blocking nature of flow within four dimensional space is the source of the ultra-efficacy of the autopoietic system. We can imagine that it is Chi (negative information and negative entropy as a mode info-energy) that flows through this 24 cell lattice. We can consider a model of this to be what the Chinese call Acupuncture. Underlying acupuncture is the 5 Hsing which is modeled by the pentahedron of four dimensional space, its minimal platonic solid and the source form for its hypercycle. We only see shadows of four dimensional solids that are rotated in four dimensional space. But those rotations may appear as solitons moving along meridians that cover the surface of the autopoietic system as hyper Kleinian bottle. It is interesting that another model of the special systems is the hierarchy of soliton, breather and instantaton. Solitons are particle-like waves that do not lose energy that travels in troughs. But if you take a positive and negative soliton and position them in the same place you get a breather that pulses like a heart. We can imagine the solitons moving around the mobus strip in which case the positive and negative solitons would coincide. We can imagine a breather as existing in the circle of self intersection and thus being like the heart. If that same breather was placed in the hyper Kleinian bottle then two hearts would beat as one and that would be an image of what Jung calls the Mysterium Coniunctus that we commonly call Love. But solitons can also travel through potential troughs and seem to jump around in spacetime, appearing and disappearing and crossing intervening

spaces in no time. If we posit that the prime meridian that runs around our point of symmetry in our bodies splinters and becomes several meridians under the action of the hypercycle pentahedron then we can think of the meridians as being heuristics for the paths of chi as it jumps as instantatons from acupuncture point to acupuncture point. It is speculated that the fetus once was an undifferentiated set of cells like the heart and that the acupuncture points are the remnants of that network in the grown animal. If Chi is the interaction of negative information, negentropy, positive energy and positive matter within us along the surface of the autopoietic system then we can see that acupuncture has given us a picture of the various cycles that occur in animals and how they interact. This model is based on the lattice like relations between the Platonic solids of three and four dimensional space. We can then think of emptiness as the four dimensionality within and void as the four dimensionality without in nature that we discover though relativity theory. There is only four dimensionality but it is broken up into four three dimensional spaces revolving around each other as quaternions undoing knots produced in the illusion of three dimensionality. The autopoietic system is the nexus of this quaternionic algebra at the confluence of inward and outward. Ultimately manifestation is the non-dual deeper than the ration and the doxa and thus beyond and before the difference between the paradoxical and supra-rational. It is the antipode of the *extrema* that fuses the paradoxical and supra-rational called mara/maya, dunya, and dukkha. The *extrema* is the antipode of the autopoietic system and thus manifestation. The

extrema is the poison that exists within the world which we all most swallow. It is the poison in the cloak given to Hercules by his wife without knowing the consequences of her actions. It is the poison of the snakebite that strands Philoctetes on the island of Tenedos alone until he rejoins his comrades who cannot win the Trojan war without him. This poison is swallowed by Shiva and held in his throat. Only the awakening of Vishnu can cure this poison by transforming it within himself as he transitions from sleep to waking. Thus Albion wakes up and the four Zoas and their emanations, shadows and specters are reconciled in Blake's VALA. When Hun Tun is pierced by his friends North and South then he dies. As long as Hun Tun remains undifferentiated then he lives but he dies when he is differentiated and the seal of autopoietic closure is broken. Manifestation in non-dimensionality while Emptiness and Void are the four dimensionality of consciousness and nature as our bodies. Non-dimensionality is the center around which the four dimensional quaternion rotates. The non-dimensional can only be indicated with the hundred *nos* which takes us beyond what the tetralemma points at into the realm indicated by the Awakening of Faith and other Mahayana Sutras. Getting to this pivot point is crucial for understanding what the nature of the autopoietic living system/meta-system is in its profound depths.

Four Logics that Undergird the World

We have noted that manifestation is the pivot around which the divided line of plato unfolds, and that unfolds by the logic of the projection of the autopoietic system as the uncomputable next

threshold beyond the computability of the system and meta-system as Turing machine and universal Turing machine. Subsequently the reflexive and dissipative thresholds unfold from the deeper autopoietic threshold as a rapprochement back toward the limits of system and meta-system. Thus unexpectedly the autopoietic system comes to indicate manifestation the deeper non-dual beyond void and emptiness rather than merely the four dimensionality, i.e. it points to non-dimensionality. This mandala of the divided line is completely different from the mandala of four dimensional space. That mandala is governed archetypically by the epic of Gilgamesh which points to the four aspects of four dimensionality. Jung indicates this in his Aion where he talks about the marriages of Moses. What I realized was that Enkidu goes round the cycle backwards from the direction that Gilgamesh goes around it. Gilgamesh when Enkidu dies moves toward Noah, the Antropos, whose wife gives him the plant of life, and from whom in turn it is stolen by the serpent. Enkidu on his way to the underworld first encounters the serpent, then the plant of life and then the anthropos. These are in fact the four aspects of four dimensionality of consciousness that gives it its empty quality. Enkidu as the anti-hero is the animal man, associated with the Beast of Beauty and the Beast, and Phantom of the Opera, he is the pharmakos, like Oedipus. The pharmakon has a different set of tools than the hero such as Perseus. These tools are helmet/ring, shield/mirror, scythe/key, bag/glove, and shoes/reigns. The tools of the Beast are an image of the special systems. The tools of the pharmakos and the hero provide an image of the pentahedron of

four dimensional space within the three dimensional world. When we enter into the four dimensional world of existence we meet the serpent, which stands in for the reptilian brain. It is this level of existence where all the knots are untied. Here we see the five Hsing as the hypercycle of transformations that appears enclosed in the autopoietic system according to acupuncture theory. At this level the traumatic traces can be erased as described in David Levine's Somatic Experiencing therapy. The next step is the realization of the existence of the plant of life. Here we meet ultra-Being and it is realized in four dimensional space as the Donaldson fake topologies embedded in only four dimensional space. The ultra being is what causes the transformation of the epics of the Western Worldview as from mythopoietic to metaphysical. Finally we meet the anthropos which is the universe as the big man which is the inversion of man as the little universe talked about by Ibn al-Arabi. Each position on the cycle of the quadrate of quadrates is an aspect of four dimensional space and thus an aspect of the emptiness of consciousness. This forms a mandala which allows consciousness to realize its intrinsic nature which I would call individuation following Jung. There is the duality of the pharamkos and hero, the animal-man and the man-god. There is their opposite cycles around the quadrate. The epic of Gilgamesh tells the outward cycle but the inward cycle is left implicit. Gilgamesh goes to the end of the earth, meets Noah, and gets the plant of life that gives freedom from death but then loses it to a snake on the way back home as he is bathing in a stream. Enkidu on the other hand dies and thus encounters death due to his animal nature. But his animal

nature is a resource because within it at the base level is the reptilian brain which is living in four dimensional space rather than three dimensional space. This reptilian brain when unleashed can erase the traces of trauma. We go from twin images of the five Hsing, i.e. yang and yin versions to a single version. When the traces of trauma are erased then Enkidu finds the quintessence, i.e. the trace of ultra being within existence. Ultra being is the fifth meta-level of being whose existence I have always denied. However, it is possible that it is because that would explain the transformation of the worldview from mythopoietic to metaphysical. If Enkidu takes hold of ultra Being as the quintessence (both aspect and anti-aspect) then he finds within death, i.e. within the fourth dimension, the basis of life. This is analogous to discovering the Donaldson fake differential topologies underlying the fourth dimension. Only the fourth dimension has infinite differential topologies. Differential topologies means that there are different ways for the topologies to transform into each other, there are infinite possible categorizations of topologies and their relation to each other in four dimensional space while in all other spaces the topological categorization and their relations are fixed. Thus four dimensional space has a basis for continual transformation in its underlying structure. It means that it has the nature of suchness, because its topological undergirding is not fixed. This lack of fixity gives another level of transformation beyond the undoing of the knots. It means the very substance of four dimensional space has no fixed ordering. The space itself is slippery, it is not just that knots untie within it, but it can untie itself by moving from

differential topology to differential topology. Four dimensional space, i.e. the space we actually live in, is the only space with this enigmatic nature. Endiku discovers this in death. Death is the entry into existence. First through the sinking into the reptilian brain, where all the traces are erased, as in nirvana where karmic traces are erased. But beyond that erasing of karmic traces there is something else, described in Mahayana Buddhism which is the interpenetration of all things, which we see in the hypercomplex algebraic models. But beyond that interpenetration, and the untying of the knots there is also the fact that the topology of the space itself is not fixed and thus is slippery, which is called suchness or thusness. Enkidu in death enters into this suchness and becomes one with it. This is the essence of tracelessness, signlessness, of there being no arising and no vanishing. Now Enkidu goes on to enter into the anthropos position. This is to say that the universe is a big man and man is the little universe. In other words interpenetration occurs through man, not through things by themselves. Man is the barzak through which the interpenetration occurs among things. We know about this interpenetration from Bells Theorem. It says that things once together always remain connected even at a distance, by spooky action at a distance. Since everything was together at the Big Bang that means that everything in the universe is connected through this connection at a distance. But man is the mirror to this universe and thus as such the universe is a big man and man is a little universe as Ibn al-Arabi says. The anthropos is the filtering of the interpenetration of all things through man. Enkidu becomes the nexus of this interpenetration next.

Finally Enkidu becomes Gilgamesh, i.e. the animal-man becomes the man-god. Enkidu is ultimately Gilgamesh. That is the secret of the cycle. The cycle shows how the anti-hero becomes the hero by moving backwards around it. The god-man is the one who reflects heaven rather than the reflecting of earth as the man-animal does. Heaven and earth are opposites and man is between them having a dual nature as god-man and man-animal. The opposites roll over. When Enkidu becomes Gilgamesh then as Gilgamesh he recognizes that Enkidu has died and goes in search of the plant of life to heal him, but fatefully loses it. Gilgamesh's journey shows us the four non-duals. When Enkidu dies then the order of things is put out of balance. He goes to see Noah who knows it is not right to give Gilgamesh the plant of life, but is persuaded to do so by his wife. The plant of life as the source of immortality is the source of all good things. But when Gilgamesh goes swimming in the river and puts the plant down he is fated to lose it to the serpent. Gilgamesh returns empty handed. This emptiness signals the transformation of death through the realization of emptiness. Emptiness is the split between Gilgamesh and Enkidu. Gilgamesh had over weaning pride and was taking the brides of others on their wedding night. Enkidu was sent to balance him out. Enkidu is the emergent event appearing from the wilderness of Wild Being. Enkidu appears and can at first talk the language of animals. But when he has sex with the prostitute he loses this ability. This is the first emergent event the encounter with Aphrodite that arises as Uranus has his genitals cut off by Kronos to give rise to Aphrodite. That is the movement from the first age to the

second age. Before that man was an animal like all other animals, knowing their language. When Enkidu is brought to town he and Gilgamesh struggle and fight with each other. But neither is strong enough to win. Gilgamesh has met his match. They become friends. They go out together to fight Humbaba in the land of Kur. They defeat him together in heroic style. But after that Enkidu falls down the hole into the underworld and dies. When his friend dies then Gilgamesh must face the reality of death. Death is the door to emptiness. But emptiness is not a lack of form, rather embedded in space is the possibility of the unfolding of form and that is called emptiness. It is the four dimensional space that lies behind the apparent three dimensional world. Consciousness is inherently four dimensional and that is called emptiness. Its dual is the inherent four dimensionality of spacetime underlying the physical world which our bodies inhabit. Emptiness and void are names for the inward and outward. The difference between inward and outward is manifestation.

When you see the natural mandala of consciousness as a result of individuation, then it becomes clear that all trauma is merely the disturbance of this four dimensional substance in all its aspects. One can see that there is Mulk, Malikut and jabrut, i.e. the realms of men, jinn and angels. The realm of the jabrut is fourfold because there are four major angels and so is the realm of the Mulk. But the realm of the Malikut is sixteen fold. That is where the traumatic distortions lie. One can concentrate on the jabrut and Mulk and the distortions disappear. One can concentrate on the Malikut and the distortions reappear. In

this way one can catch glimpses of the distortions at the various levels of mundane consciousness, super-consciousness (dream) and ultra consciousness (dreamless sleep). But immediately the question becomes the nature of the difference between inward and outward and that is what brings about the advent of manifestation, non-dimensionality behind the four dimensionality of consciousness and the outward material world. Manifestation is the deeper non-dual beyond emptiness and void. When you focus on that there is purity there, beyond purity four dimensional consciousness and impurity of the traces and distortions. This purity is what surrounds the distortions and traces of trauma which is unaffected, because the non-dimensional is beyond all effects of created things. This is described as the tathagata gharba in the awakening of faith. Beyond the statement that emptiness is form and form is emptiness there is the hundred nos, no form, no emptiness, no dimension. We reenter the realm of form and emptiness with the assertion that form is form and emptiness is emptiness which is the supra-rational statement that balances the paradoxical statement that mixes form and emptiness. This pivot point of the tathagata gharba forms another mandala which is different from that of the emptiness of the four dimensionality of consciousness symbolized by the cycle of Gilgamesh and Enkidu. Here we find that the autopoietic system operates in another register as the indicator of manifestation rather than just emptiness. Here another aspect of four dimensionality comes to the fore, which is that there are four three dimensional spaces in four dimensional space. Each of these four three dimensional spaces

revolve around each other based on quaternion rotations. Each one contains a tetrahedron, the minimal platonic solid of three dimensional space. That tetrahedron is composed of a Zoa, emanation, shadow and spectre. There are actually four divided lines, not just one as Plato tells us. Blake sees four: Urizen, Tharmas, Urthona and Luvah. Plato's divided line is that of Urizen and is the one that we have developed in our tradition. But just as basic is the Emotional divided line, the one based on the genetics of evolution passed through the parents, and the one based on the connection to the earth. The other divided lines have been forgotten in our culture. The four divided lines are symbolized by the four three dimensional spaces that revolve around each other in four dimensional space. They revolve around the central point that is *no dimensional*. That is the source beyond the four origins in each of the three dimensional spaces. The tetrahedron of origins indicate the negative dimensional center point, the one source from which all the other sources derive that appears in the inverted pascal triangle beyond the odd zero. The pascal triangle that represents the minimal solids in each dimension is inverted to produce a negative dimensional triangle of sources which give us the hyper-algebras as a subspace beneath the positive dimensional spaces. This subspace is not recognized by mathematics, but is the basis for the interpenetration of all the points in higher dimensional spaces. The subspace organizes all the sources that unfold from the single source as the hypercomplex algebras differentiate as the negative pascal triangle goes toward infinity. The negative dimensional pascal triangle is where the roots of the world

tree are gathered and they represent the heuristics: great ultimate (1), yin/yang (2), major/minor//yin/yang (4), trigrams (8), Ilm al-Raml (16), five Hsing (32), hexagrams (64), bei (128), ifa (256), etc. The world tree unfolds in the positive dimensions and is related to the platonic solids and their lattices in three and four dimensional space, it is these lattices that also describe the cycles of the autopoietic system as they appear in Acupuncture theory⁴.

Here we want to explore the logics associated with the four three dimensional spaces. These are the logics of Set, Mass, Field, and Reserve. Mathematical Category theory that is the basis of math is lopsided because it only recognizes sets as the most basic category. Set and anti-set that comes from reversing arrows are basically the same thing. There is no genuine complementarity. But in fact we should recognize that the opposite of the Set is the Mass. Sets have unique particulars which are all different. Masses have identical instances that are all the same. The particulars in a set participate in a complex of constraints called an essence. When we add to the particular a universal we can reason using the syllogism which has three permutations: deduction, induction and abduction. The opposite of this is to add a boundary to the mass and use a pervasion logic which has parallel de-vasion, in-vasion, and ab-vasion lines of reasoning. In India pervasion logic was developed rather than syllogistic logic developed in the west. This same logic became part of Buddhism and was preserved in Tibet and transferred to China. However, we do not recognize this alternative logic in

⁴ See Emergent Worlds by the author

the West. What is interesting is that it is possible that the Greek Philosophers before Aristotle were using a Mass logic rather than a Set based logic, and that the Platonic forms were really Masses. If this is true then the set bias of our tradition has a definite beginning with Aristotle who also posited the principle of excluded middle. The point is that once we recognize the complementarity of Set (particular-universal) syllogistic logic and Mass (instance-boundary) pervasion logic, then we can see the complementary logics that are opposite these two. That is the Reserve (potential-????) conservation logic and the Field (intensity-????) transformation logic. These other two logics are discovered in physics through the idea of conserved values like energy, and through the idea of fields like the magnetic field. These four logics are related to the four aspects of the meta-system Arena = Set, Boundary = Mass, Origin = Field, Source = Reserve. Thus category theory in mathematics should change to recognize these four complementary fundamental categories rather than just the Set category as basic. This recognition would serve to unify physics and mathematics by including some of the intrinsic logic of physics into mathematics. The other fundamental change to category theory would be to recognize that beyond the determinate Pure Being of the categories there is also Process Being, Hyper Being, Wild Being and Ultra Being. In Process Being the arrows become probabilistic, then the arrows become possibilitistic in Hyper Being, and finally the arrows become propensities in Wild Being. Arrows vanish when we come to existence. These four logics and their complementary categories correspond to what Blake calls Zoas, Emanations,

Shadows and Spectres. They correspond to the four divided lines related to the four Zoas. Four Zoas into four aspects gives us sixteen which is the nature of the quadrate of quadrates that Jung speaks of in Aion. This is where all the distortions of the trauma occur within the imaginal realm. The Malikut is the middle realm between Jabarut and Mulk. This middle realm differentiates into the quadrate of quadrates based on the differentiation of the four logics. These four logics form a mandala around the non-dimensional manifestation using a different aspect of four dimensional space, which is that it is made up of four three dimensional spaces. Each space is a divided line emanating from a particular source Zoa through the unfolding of origin (emanation), arena (shadow) and boundary (spectre). A key point from this point of view is the fact that the trauma does not have to be done away with, the body should not be hidden in the purity of manifestation. The trauma must be accepted because without the trauma there is no individuation of the self. Just like the poison of the extrema must be transformed by the non-duals so to the traumatic distortions of the Malikut must be transformed by manifestation.

There are two mandalas. There is the Gilgamesh mandala of the four dimensional nature of consciousness that Enkidu the pharamkon discovers. Then there is a second mandala that takes into account the difference between the emptiness of consciousness and the void of matter. This leads to the middle way between the supra-rational and the paradoxical which is manifestation. Manifestation is what the Buddhists call Tathagata gharba in The Awakening of Faith which is not emptiness or not void

and not form or any other schema, like pattern, system or meta-system. The schemas are set like. But there is the mass like opposite of the schemas that we discover in the physus. In the physus are the emergent levels of string, quark, particle, atom, molecule, macro-molecule like DNA, cell, organ, organism, society, gaia. But the nature of all these things that are discovered in nature is quantum mechanical, they are all mass like ultimately in the strange way that they conform to negative and imaginary probabilities. This means that opposite the mass like and set like physus and logos there are a complementary field like and reserve like aspects of the world. There are two other intertwined hierarchies related to the individual processing of information and the social construction of knowledge.

- ?? ABSOLUTE = Manifestation
- ?? realization
- ?? EXISTENCE
- ?? insight
- ?? ONTOS
- ?? wisdom
- ?? EPISTEME
- ?? knowledge
- ?? PARADIGM
- ?? Information
- ?? THEORY
- ?? Data
- ?? FACTICITY
- ?? Given
- ?? SUCHNESS

These two intertwined hierarchies are related to the field and the reserve. The reserve is indicated by the social hierarchy whereas the Field is indicated by the individual hierarchy. The social and the individual hierarchies relate to the production of nihilism. They are on

the axis between finitude and infinitude within the worldview whose non-dual is the right. Physus and Logos on the other hand are on the axis between reductionism and skepticism. Nihilism produces two extreme artificial opposites which are secretly connected by the non-duals. Suchness is the four dimensional and the absolute is the non-dimensional. Between the two mandalas there is the constitution of the various emergent levels of understanding both socially and individually. This understanding changes over time via emergent events. Emergent events are intensifications of nihilism. The four dimensionality of consciousness or of spacetime forms a field. The non-dimensionality of manifestation forms a reserve. The various levels of the hierarchy that intertwine give us the thresholds that appear between field and reserve, between finite four dimensionality and non-dimensionality at infinity. The meta-system appears outwardly and inwardly to the system. When it appears outwardly then it is like a social field. When it appears within the individual it is more like a reserve. Knowledge and wisdom appear from we know not where within us. They are invisibles that appear from nowhere at the moment we need them. Knowledge is held in reserve. On the other hand the social realm has all these invisible lines of force that produce the habitus⁵ that condition theory, the episteme, the ontos etc. The worldview is structured by the four logics related to set, mass, field and reserve. But basing everything on set logic we give a distorted vision of the structure of the world.

Weak Measures applied to

⁵ cf Bourdeau

Autopoietic Systems

Given this metaphysical background we are now prepared to look into the subject of this paper which is the relation between weak measures of Yakir Aharonov as applied to the theory of autopoiesis. The concept of weak measures is that instead of making a measure that is so strong as to cause a collapse of the quantum probability wave one instead makes a much weaker measure that does not disturb the wave packet sufficiently to cause quantum collapse of the packet. One instead measures weakly many identical quantum systems and by this means approximates measures of the internal variables within the system which cannot be seen after the collapse of the wave packet. The interesting thing about weak measures is that it means that many times weak values are measured which vanish after the collapse of the wave packet which are very different from what might be expected including impossible negative values. In other words after collapse there are the eigenvalues which represent the results of strong measurement, but prior to collapse there are weak values that are different from these eigenvalues but either within the expected range or outside the expected range. The interesting situation is when the weak values are far outside the expected range of the eigenvalues perhaps in negative territory in some impossible region.

When we apply weak measurement ideas to autopoietic systems one of the interesting things is the way it causes us to interpret non-computability of the autopoietic system. Non-computability has many types but one type of non-

computability that we are unlikely to think of is the non-computability due to impossible values of variables taken as the basis for computation. This is a very strong type of non-computability that has nothing to do with the algorithm, but rather what the algorithm is given as a premise for computation. If within the boundary of the autopoietic system we are given impossible values for computation then it is clear that this is a strong type of non-computability. Computation become impossible given impossible starting values of variables. Weak variables give us some picture of what is happening inside the autopoietic system without breaking its information seal. One of the things we have mentioned is the idea that within the information event horizon of the boundary of the autopoietic system there is negative information. If this is true then we can think that negative information is the source of these impossible values that deny computation any basis to get started or produce meaningful results. Negative information is the same thing as the negative values of weak values found in quantum weak measurement. Negative information is then the source of the non-computability of the autopoietic system.

So from this it becomes clear why we might like to delve into the relation of quantum weak measurement to the attempt to understand the strange characteristics of autopoietic systems. This means of course having to get far more specific about the relation of weak measures to autopoietic systems. In a measurement regime there is usually a microscopic quantum system which is being measured. Von Neumann suggested that there is a pointer p at the

microscopic level in the measuring device attached to the quantum system. It is the value of this pointer p that we wish to raise to the macroscopic level in order to read the measurement. Now of course in quantum measurement there is an interaction between the measuring device and the system being measured which produces uncertainty in the result of the measurement. This is called the Heisenberg uncertainty principle. In effect when you measure a quantum system you participate a collapse of the quantum wave function which is under superimposition of states and produce the eigenvalue states that are the possible actualizable measurement results. The superimposition of the states in the quantum wave function translates into uncertainty with regard to the eigenvalues that will result from the final measurement. All that is known is the probabilities of the various possible results, but in each case the specific determinants are unknown for any given quantum system after the wave function has collapsed. In weak measurement the idea is to disturb or perturb the quantum system with the measurement device without collapsing the wave function. This perturbation can be tuned from zero disturbance to the point of the strong measurement that would break the seal of the quantum wave function causing it to collapse. The measurement achieves accuracy by being projected on a whole set of identical quantum systems rather than just one. But doing weak measurements on many different identical quantum systems one achieves accuracy in the estimation of weak values that give us some insight into what is going on within the sealed quantum wave function. Notice how we are transitioning from Set to Mass ways of working here. All the

identical quantum systems form a mass and the weak measurements are summaries of the mass properties which give us some insight into the workings within the quantum system that we would not have otherwise. Treating each quantum system as different and measuring it strongly to get the results of that particular quantum collapse is a Set like way of dealing with the quantum system which sees it as different from all the other quantum systems with its own particular values within the range of possible eigenvalues as determined by the probabilities of the quantum collapse. Now weak measures are complex numbers rather than real numbers. They are the conjugate⁶ of p the pointer value and are called x having the form $ax+bi$. The ax value is seen “the size of the physical shift of the pointer position⁷”. On the other hand the bi value “indicates how much the momentum of the pointer will change as an unintended consequence of the measurement interaction, and consequently, how large the back-action of the measurement on the system.” In other words the pointer p of the measurement apparatus does not just measure the system, but there is also a measurement of the back-reaction of the system against the measurement action which is x . But this back-reaction is split into the physical shift of the pointer position as a result of measurement and the back-reaction of the apparatus against the system due to that shift. In other words there is a

⁶ Botero, Alonso “Sampling Weak Values: A Non-Linear Bayesian Model for Non-Ideal Quantum Measurements” Dissertation U. Texas Austin 1999 quant-ph/0306082 11 Jun 2003, page 11

⁷ “Speakable and Unspeakable, Past and Future” Aephraim M. Steinberg arXiv.quant-ph/0302003v1 31Jan2003 page 8

dampening out of mutual reactions. First the measurement occurs that should establish p but then the system acts back on the apparatus to shift the pointer value by x but then this causes the apparatus to act back on the system by some amount expressed in the imaginary part of x , i.e. the $ax+bi$ which is never separated from the real part of x . Now what I would like to suggest in order to connect weak measurement with special systems theory is that there is a hierarchy of these dampening relations and that weak measurement has only established the first layer of these dampening harmonics. There is also, beyond weak measurements associated with dissipative special systems, limp measurement which has the form $ax+bi+cj+dk$ associated with autopoietic special systems, faint measurements of the form $ax+bi+cj+dk+eE+fI+gJ+hK$ associated with reflexive special systems, and so on up into the realm of tenuous measures related to meta-systems such as the sedenion and other non-division hypercomplex algebras beyond the sedenion. If we see this hierarchy of dampening relations between the measurement device and the system as an extension of weak measurement theory then what we notice is that the ability to interpret the imaginary part becomes harder and harder at each stage. Think about the relation between the quantum system and the measurement device. We know in weak measurement regimes we can take simultaneous orthogonal weak measures of a system. Thus a system can be seen as having myriad measurement devices hanging off of it taking simultaneous measures of it without breaking its quantum envelope. Think of this as a scene similar to what Deleuze and Guattari call the hanging of desiring

machines off of the body-without-organs. The body-without-organs symbolizes the unconscious, that which cannot be known, but also the body considered as whole and opaque, which you cannot see into to discern its organs. Now a weak measurement device is like a dissipative practice hanging off of the system. The weak measurement device protrudes from the system and this extends it into the meta-system to some extent. Limp measurement devices do the same only they are made up of two weak measurement devices in a symbiosis. Faint measurement devices extend the system into the meta-system even further only they are made up of four weak measurement devices or two limp measurement devices. The devices are conjoined. They feed their measurement results not to the system but to each other. In this way they simulate the interior of the opaque autopoietic system in the exterior of that system including giving some insight into the impossible weak values within the system, i.e. its negative information. Each set of weak, limp, faint, and other tenuous measures which form a rhizome across the surface of the autopoietic system extend it into the meta-system, i.e. the environment of the system and provide a dampening of the results of measurement. These measurements are perturbations of the autopoietic system which simultaneously simulates its inside opacity on its outside in the dampening relations with its measurement environment. The environment is seen as a set of orthogonal probes that does not break the event horizon of the autopoietic system but still renders it transparent in a simulation of its impossibility. This is the same as conferring on the autopoietic system negative and imaginary

probabilities. In other words we can consider the system and its myriad of measurement apparatuses as a meta-system governed by negative and imaginary probabilities rather than as a closed system with only positive probabilities yet closed and under the probe of myriad orthogonal measurement apparatuses. In other words the measurement apparatuses may be seen as extensions of the system itself but that brings the negative and imaginary probabilities out into the open rather than merely relegating them to the safety of the enclosure of the autopoietic system. The meta-system acts as a filter on the system. That filtering can be done by measurement. Thus the meta-system can be seen as a myriad of probes of the system which do not break into its interior but merely perturb it to see how it reacts so small disturbances. The meta-system can glean things about the interior of the autopoietic system that cannot be gleaned by opening it up, i.e. something about its negative information and impossible weak values. We call this gleaning theory of mind, i.e. when we cut through the images that are produced in the reflexive environment to posit what the other knows. We know that we are good only to the fourth meta-level of calculating that she thinks that he thinks that she thinks that he thinks ... Theory of mind allows us to cut through this escalating recursion to posit what the other knows. I believe we do this using weak measures that allow us an inkling of what is going on inside the head of the other without opening it up and looking inside, i.e. asking direct questions to which we might get lies as answers.

Now let us change gears and consider a case of weak and strong measurement at

the macro level. Sheldrake in his work on The Sense of Being Stared At says that there is a five percent bias toward being able to sense being stared at. A strong measure is when one stares at someone long enough to attract their attention. But a weak measure is to glance at someone just long enough to take in some information about them without attracting their attention⁸. Now in a public place there is a lot of weak measurement going on continually of everyone by everyone in the public gathering. Everyone is checking out everyone else to determine their own safety from those in the public space but also for opportunities that the public space offers. There are strong barriers between different parties in a restaurant for instance. We don't just walk up and join any table usually. But still we continually check each other out with glances which seldom turn to stares that will attract the attention of the other. It has been noted that humans only stare at each other when they intend violence or sexual conquest. Thus stares are very strong measures. But glances are weak measures, and the whole idea is to glance only long enough to take in information about the other without the other noticing. Now in a public situation this glancing around by everyone checking out everyone else is a regime of mutual probing that continually goes on looking for trouble or opportunity by each with respect to the other. It is my conjecture that this glancing takes weak measures and as such simulates the non-computable inner workings of the mind of each person present so that the theory of mind can posit what is going on within them, i.e. what they know and what they

⁸ I am indebted to Arshad Mahmood for this example of macro-weak measurement

do not know. We are sure enough about this positing of the theory of mind of the other that we base our actions toward the other on it. And thus the social fabric of behaviors and perceptions of other by other is built up as a reflexive field. Notice that the measure of a single system, say by a direct question about what is going on inside, is a Set like relation. But weak measurement glances at a myriad of systems and takes up a Mass like relation to them. But when everyone one is probing everyone else by glances then we produce the fabric of what Deleuze and Guattari call the *socius* and this is a Field like relation of a weak measurement regime. When we nod or point or get others to join us in glancing at the other then we create limp, faint and other tenuous measurement regimes where we are sharing weak measurements and feeding them back to each other. We refer to this as *wink wink and nudge nudge* in common parlance. The nudge part has to do with trading weak measurement targets. The wink wink means agreeing on the assessment of the weak values taken from the weak measurements of a target. It is clear that we share weak values taken from weak measurements, thus we can think that we probability share limp values taken from limp measurements, and faint values taken from faint measurements as well as tenuous values taken from tenuous measures. In this way we build up the field of the meta-system of probes by glances that produces our insight into the inner workings of individuals within the public sphere without asking them. When we consider the field-like relation that is produced in the socius, which renders the subject of the glances of the others transparent then we recognize the reserve-like relations between the

unconscious of that person, the reserve of negative information, and the persons behavior within the field. In other words the field of weak measures gives us insight into the impossible values of negative information within the person's encapsulated autopoietic boundary, and thus in some sense renders that person transparent in a certain sense, thus giving rise to insight into their unconscious motivations. We bring a conservation logic to bear on the person, accounting for their actions with regard to the negative information that they conceal perhaps even from themselves. The field like interchange of weak measures makes this understanding possible which underlies our positing of the theory of mind of the other that cuts through all the reflexive proliferating images generated by self and other. This gives us a different understanding of the collective unconscious and the collective conscious. There is beneath the intentionality of consciousness the non-intentional awareness. It is the awareness that supports the glancing around at others in public that takes the weak measures of those who are present in our environment. The sense of being stared at is a measure of the sensitivity of awareness. There is a slight bias toward that sensitivity according to Sheldrake. On the basis of the weak measures we posit the unconscious, negative information, concerning the other. The negative information concerning us all is the collective unconscious. The positive information about us all is the collective consciousness. Raising something from awareness to consciousness involves subjecting it to intentionality. Negative information combined with intentionality gives us desire, dissemination, avoidance, and absorption; that is the dissipative

practices. Intentionality is an ordering of behavior towards some ends, or a positing of some organization within perception. Ultimately it is based on the projection of schemas. Thus we have a combination of negative entropy and negative information at the core of the autopoietic reflexive special system which we alluded to earlier. If information only exists when there is surprise, i.e. some emergent event, then negative information must be a de-emergent even, an obscuration of surprise, the hiding of what would surprise us. Negative information concerns what does not appear, what continues to be hidden, what Henry calls the Essence of Manifestation. This source within us of our motivations and desires, or our avoidances, or our absorptions, or our disseminations appears in the reflexive field through weak measures of others which we share, and by sharing them make the unconscious motivations of the other transparent to a certain extent, perhaps only virtually. But its virtual appearance of the impossible values of negative information is good enough as a basis of action toward the other by the group which allows the group to know the unknowable, positing a theory of mind for each individual, whose inner state is not computable. That non-computability is strong because it is based on impossible values like division by zero, or negative values for variables that should not be negative, or imaginary values. It is not the non-computability of halting, nor that which would take too long, nor that which would simulate its own future state given a chaotic computation.

Schematization and Weak Measures of the Environment

We have posited that there is a way to apply weak measures at the macro level in order to render transparent the autopoietic system in the reflexive field as a means of building the possibility of the theory of mind that cuts through the myriad reflexive images generated by the political landscape between humans trying to figure out what other humans will do, or think, etc. The weak measures, can be seen as a scheme of dampening of mutual back reactions between measuring devices and the systems measured. We have seen that these measuring devices can be seen as dissipative practices and that these may combine into a rhizome across the surface of the autopoietic system which feeds back to each other their weak measures and thus approximates the negative information within the autopoietic system rendering it partially transparent, perhaps translucent. But what if we turn around the measuring devices and apply them to the meta-system rather than the system. We have seen that the measuring devices extend the system out into the meta-system by degrees related to the special system. The meta-system filters the system by these measuring devices that allow weak, limp, faint and tenuous measures. But can we think about how the system might measure the meta-system instead. The measurement devices might be seen as probes of the meta-system by the system. Now turning the concept of the measurement device around in this way and retaining the idea of weak, limp, faint and tenuous measures, bring us to the question of how measurement occurs. Tim Ferris makes the point that measures only confirm our prior categorizations and cannot disconfirm them. Measures only give us data about things we have

already fixed what they are. The process of fixing what something is to be measured is not covered in measurement per se. Rather this is covered in categorization of the things in our environment. It turns out that experiments on surprise show that we categorize first before we see specifics of the new thing being observed. First there is sensation, then categorization, then specifics, then meaning. The brain thunks is specific wave formations related to each of these stages. Similarly there are brain damage patients like David spoken about by Demasio in The Feeling of What Happens that can only relate to generalities not to specifics in their encounters with others. So it appears that Kant was right based on this research that we do schematize. Part of this schematization is what is known as geometrical schematization which looks at the general articulation in spacetime of the object. This geometrical schematization is mentioned by Umberto Eco in his review of the subject called Kant and the Platipus. It is this geometrical schematization related to the unfolding of Pascal's triangle that I mean by schematization. It is the most general form of schematization, after which other kinds of categorization, and individuation occur. Kant posits that spacetime is something projected by humans. Schematization relates the categories to time in Kant's system. This has its roots in Plato's theory of forms especially that presented in the Timaeus. We have noted that this schematization of the object in spacetime related to Pascal's triangle that specifies the minimal Platonic solid in each dimension. From this mathematical object it is possible to derive the general hierarchy of schemas which include: pluriverse, kosmos, world, domain,

meta-system, system, form, pattern, monad and facet. Each schema inhabits two dimensions as both container and contained for the adjacent schemas in the hierarchy. So, for instance, pattern is both one and two dimensional, form is both two and three dimensional, system both three and four dimensional, etc. We project the schema in spacetime prior to any other categorization of the object under consideration. Projection of the schema must underlie all measurement which presumes more sophisticated object classification as its prerequisite. Thus we can project a sequence in which the emergent object appears that first receives its sensations and then projects on that sensation a schema or series of schemas and then categorizes the object seen in spacetime within its schema. This categorization is followed by the specification of the individual object as one of its kind and after that we comprehend its meaning. Moving from Sensation to Meaning there are three steps. The first step is spacetime schematization, then categorization, then individuation. If sensation is the meta-system and meaning the system then according to Somatic Experiencing Therapy there are three steps related to imagination (reflexive), behavior (autopoietic), affect (dissipative). We imaginatively project the schematization of the object in spacetime and this is a socially conditioned projection. Based on this we categorize and react to that categorization even before we individualize. When we individualize we generate affect. Finally the affect turns into grasped meaning. This way of understanding the processing within the human being is called SIBAM⁹ in Somatic Experiencing theory. It gives

⁹ Sensory, Image, Behavior, Affect, Meaning

more articulation to J. Kagan's model of how we react to surprises¹⁰. It allows us to see how the projection of schemas in the sense of geometric schemas may be separated from categorization. In schema projection imagination is the key whereas in categorization behavior is the key. In other words when we decide on the essence of the thing we are dealing with it determines our behavior towards it. On the other hand schematization in the sense that I use the term does not determine behavior but is an imaginative projection of the schema on the sensory data that is the prerequisite for determining the essence. Projection of schemas without structured sensory input is a pure projection of schemas which we normally think of as the imagination. Structured sensory input shapes the schemas to fit the given data so we can figure out how it is laid out in spacetime as a first step in determining what it is. That first step merely establishes existence thus, i.e. according to a particular schema that is coherent with particular dimensions of spacetime. Kagan does not separate these two phases of schematization and categorization in his model of how the brain "thunks"¹¹ the data in separate

processing steps. We call these schematizations and categorizations *thunks* because for the most part they are brought to bear immediately with little thought. It is only in the case where they have to be built as in the cases Kagan is studying that we actually see them taking much time in brain processing. Umberto Eco makes a clear distinction between these geometrical schemas and the categorical schemas and the individuating schemas. We wish to separate out the spacetime geometrical schemas from the categorization because we hope to understand these imaginative projections more deeply. Kant made the transcendental imagination a separate faculty in the first edition of his Critique of Pure Reason. Schemata are separated from the categories as their application to time. Here we wish to establish the

¹⁰ **Jerome Kagan** *Surprise, Uncertainty and Mental Structures* [Cambridge, MA: Harvard University Press, 2002, 259 pp., £20.50, ISBN 0-674-00735-2 (hbk).] <http://users.vianet.ca/~gnox/KaganRvw.htm>

¹¹ **thunk** /tuhnk/ n. 1. [obs.]"A piece of coding which provides an address", according to P. Z. Ingerman, who invented thunks in 1961 as a way of binding actual parameters to their formal definitions in Algol-60 procedure calls. If a procedure is called with an expression in the place of a formal parameter, the compiler generates a thunk which computes the expression and leaves the address of the result in some standard location. 2. Later generalized into: an expression, frozen together with its environment, for later evaluation if and when needed (similar to what in techspeak is called a `closure'). The process

of unfreezing these thunks is called `forcing'. 3. A [stubroutine](#), in an overlay programming environment, that loads and jumps to the correct overlay. Compare [trampoline](#). 4. People and activities scheduled in a thunklike manner. "It occurred to me the other day that I am rather accurately modeled by a thunk -- I frequently need to be forced to completion." -- paraphrased from a [plan file](#).

Historical note: There are a couple of onomatopoeic myths circulating about the origin of this term. The most common is that it is the sound made by data hitting the stack; another holds that the sound is that of the data hitting an accumulator. Yet another suggests that it is the sound of the expression being unfrozen at argument-evaluation time. In fact, according to the inventors, it was coined after they realized (in the wee hours after hours of discussion) that the type of an argument in Algol-60 could be figured out in advance with a little compile-time thought, simplifying the evaluation machinery. In other words, it had `already been thought of'; thus it was christened a `thunk', which is "the past tense of `think' at two in the morning".

[Source](#): *Jargon File 4.2.0*

<http://dictionary.reference.com/search?q=thunk>

geometrical schemas as a prerequisite for measurement in any environment. They are prior to the categorization that would determine the appropriateness and significance of a measurement. The measurement is a behavior and the result of a measurement may precipitate an affective response. So measurement fits right into the SIBAM model. We have to imagine what to measure before we do the measurement. We must determine the essence of what we are measuring so as to know if the measurement is appropriate. We should consider the appropriate response to the measurement before we make any measurements. But to all this we add the concept of weak measurement which does not disturb the environment, or meta-system. The measurer is a system in its environment. The measurer must be responsible for adapting the measurement to the environment. Strong measuring can disturb the environment measured. So what if we make weak measures of the environment, or even limp, faint or tenuous measures rather than strong ones that will disturb the environment. The concept of feeding back the results of weak measurement to the system being measured is problematic as that would defeat the purpose of not effecting the system. However, the idea of feeding back weak measures of an environment, meta-system, to the meta-system is another matter. The meta-system is already open unlike the autopoietic system. Thus feeding weak values back to the environment makes a lot of sense. In fact we can see the environment as a field or network of weak value exchange already. So feeding back weak values to the environment means merely consciously making sure that the weak values are circulated which are measured

from the environment. We take a weak measurement of the environment, trying to disturb it very little, i.e. trying to not disturb the systems within it to the extent that they lose their closure, then we make those measurements available within the environment giving it a means of compensating for what is known about the interior functioning of the environment as meta-system. This should allow the environment to adapt more robustly and with finer tuning to its own conditions. We can think of a series of steps by which sensors are spread out in the environment, which then schematize that environment (imagination), then categorize it (behavior), then individuate it (affect), before producing meaning within the environment. At each stage the results can be fed back to the environment. The measures are weak, limp, faint or tenuous if they are designed to disturb the environment as little as possible. These weak measures describe the environment as it is without the production of interference by the measurement itself. We might call this the pristine environment. We might want to know about the functioning of the pristine environment and want to attempt to make our measurement regime as small and light a foot print on the environment as possible. But since the environment is open it is possible for it to use the information gathered in this way in order to make the functioning of the environment better in some way, that is more coherent, more adaptive, more robust in its response, etc. In effect this sort of measurement regime produces not just a weak valued environment, but a limp valued environment, a faint valued environment and other tenuous valued environments beyond the natural environment which stands unmeasured.

In this process geometrical schematization is an important first step before categorization and individuation not to say meaning production.

We know that the meta-system is a model of Gaia. The meta-system differentiates by progressive bisection from the primary complementarities of source, origin, arena and boundary. The weak, limp, faint and tenuous measurement regimes may be the way that Gaia does its operating system like information processing. It is perhaps dependent on the special systems for these services. As operating system Gaia is a universal Turing machine. But perhaps there are special machines within the environment that allows for the economy and sign system of weak, limp, faint, and other tenuous measures. These special machines are the living animals in the environment who do not compute but bear the onslaught of the environment experiencing it and behaving on the basis of that experience as well as innate responses. Thus perhaps the measuring apparatuses are not just supplements to the systems within the environment but are actually the living social systems themselves as the means of circulating weak, limp, faint and tenuous measures within the Gaian operating system for spaceship earth.

Operationalizing Autopoietic Theory

The reason that the concept of weak measures is important is that it makes it possible to think about the operationalization of reflexive autopoietic dissipative special systems theory. This is a theory that is extremely difficult to operationalize because it has to do with the structure and function of

the social, life and consciousness. These are the types of entities that we ourselves are. Therefore we have some insight into them due to our introspection as living conscious social beings. However as biology, psychology and sociology have discovered these are very difficult systems to study, partly due to the many characteristics they share with quantum mechanical systems. Observation that breaks the bubble of their own self observation tends to alter their behavior and internal processing giving us skewed results. There is the famous study of a work environment which showed that any change no matter good or bad would increase productivity because the people in the study were being paid attention to in ways that were not normal to that work environment. We can look at PET and fMRI scans of brains but that really does not tell us what is going on inside those brains but merely where something is happening. We can dissect bodies of living creatures but that does not tell us about how they live in their habitats. Studies of animals in their habitat tend to disturb the environment and do not tell us much about what might have happened if we had not invaded as observers. Each of these types of system are notoriously difficult to observe and measure. But we do it anyway and for the most part we do so with strong measures, measures that get the attention of the living conscious social things we study. Considering applying weak measures to these creatures is another approach all together than the normal strong measurement regimes that are usually applied. But also turning around the scheme and doing weak measures on the environment instead is an altogether novel idea. Feeding back weak measures to the environment is also a new and

different approach that has not to my knowledge been applied previously by researchers. The meta-system is the inverse of the system. The meta-system is open and orthogonal in ways that the system is not. Thus it would be easy to place orthogonal measurement devices in the meta-system which would monitor its conditions. Weather stations do a job like this with respect to climate. They are scattered about and anyone can look up to see which way the wind vein is pointing. Similar sorts of measurement devices might be used to monitor other aspects of the environment with minimal impact so as to qualify as weak, limp, faint and tenuous measures. Autopoietic systems in the environment them might observe those weak measures in order to get a picture of the status of the environment of a different sort than might be available through strong measures. Virtual topological gradients of various kinds might be projected on maps of the environment that are localizable so one saw how the part of the environment which one is in is different than other adjacent areas or the whole environment. In a way the stock market can be thought of as a weak measurement regime because the value of the stock is more psychological than a real measure of worth. But each companies worth goes up and down everyday due to many factors that have nothing to do with the performance of the company and everything to do with the climate of the stock market as a whole. The fluctuation of derivatives might be seen as an example of limp or faint measures or even tenuous measures. So perhaps we have already implemented this type of weak measurement of the environment regime with respect to our economic system. It is clear that markets

are meta-systems and companies as imaginary persons are systems. But what are the special systems that mediate between the market and the corporation? Could we argue that the special systems that mediate are ourselves as living conscious social existents and more importantly representatives of homo economicus. The stock market is set up to be sensitive to us, our whims, more than it is set up to be sensitive to real economic factors. But is it possible to break out these special systems aspects and realize some economic benefit from their embodiment apart from ourselves? Could weak measures be a way of making that possible? All these are questions that relate to the over all question of how we should operationalize the special systems and weak measures represents a large step in that direction because they make available to us weak values that describe the negative information locked within the autopoietic system. If we consider the autopoietic system to be like the quantum mechanical system at the macroscale then by analogy we should be able to use negative and imaginary probabilities to model what is going on inside the autopoietic system or in the reflexive field surrounding it.