Mathematical and Physical Anomalies in Nondual Science

Hypercomplex Algebras, Nonorientable Surfaces and other Anomalies

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Started 04.11.06; Version 0.3; 04.11.10; nds05a03.doc

Keywords: Nonduality, Science, Western Science, Special Systems, Systems, Meta-Systems, Autopoiesis, Reflexive Theory, Dissipative Structures, Holonomics, Hyper-complex Algebras, Non-orientable Surfaces,

Hypercomplex Algebras and Special Systems Theory

We have already given a very simple analogy from mathematics for the special systems which is the perfect, amicable and sociable numbers. Now we will move on to a very complex example, the example of the hyper-complex algebras which is the key mathematical structure underlying the special systems theory. Complex numbers have been known for a long time, but Quaternions & Octonions were discovered by Hamilton and Graves about one hundred years ago. No real use in physics has been found for these numbers despite initial claims and promise. Instead we now us the vector system which is not as complicated as the Quaternions and Octonions. So it is interesting that these numbers really have no purpose in physics to date but they are seen to have an as yet undiscovered purpose in Nondual Science. Complex numbers are used in all the sciences and are fundamental to mathematics, but the higher complex numbers are really no more than a mathematical curiosity. They are not taught for the most part, and only appear in obscure mathematical books. This is because they are weaker than Complex and Real numbers which both have algebras of the same strength, all be it they are very different in the way they work. But the higher hyper-complex numbers all are weaker algebras than the Real or Complex algebras and that weakness makes them less useful. Vector and Linear Math are used to describe systems that lack these same properties. So there seems to be no real call in the description of nature for the extra sophistication necessary to introduce the higher hyper-complex algebras over and beyond vector and linear algebra. However, these numbers systems exist and they are an anomaly when one considers the infinite number of algebraic systems that can be produced using the Cayley-Dickson process. In fact there is a very clear hierarch of algebraic systems with the one that everyone learns in school and college which is real and complex being at the very top of all these systems because of all the properties they have that most other algebraic systems lack. All other algebraic systems fall off in their properties until when we reach the Sedenions we lose the division property and thus all algebras after that become almost useless from a mathematical point of view. So we are familiar with and use the two algebras out of an infinity of algebras that have the most properties, and we ignore almost all other algebras using instead vectors and linear algebra to describe systems that do not have these unique properties of the real and complex algebras. But of all these algebras the quaternion and octonion algebras still have some interest, and we really only loose interest completely when we reach the sedenion algebra which has lost even its division property. But of course very little thought is given in Mathematics to the meaning of these algebras and their hierarchy which is so unique amidst the infinite field of

algebras. This is where nondual science comes in because it wants to look at this mathematical anomaly very carefully and see whether it has any relation to the Special Systems. And of course, it does have such a relation, in fact the hierarchy of hypercomplex algebras is the main bastion of the theory. We take hypercomplex algebras as the touchstone for the organization of the Special Systems and we see that it is through the hypercomplex algebras that the Special Systems point toward the nondual basis in the most emphatic manner of all the anomalies explored so far.

The story of the hypercomplex algebras and the Special Systems goes something like this. Imagine a systems theory built on the hypercomplex algebras, it would necessarily be striated and broken into emergent levels one for each of the algebras. Thus the real algebra would represent the system, the complexnion algebra would represent the dissipative ordering special system, the quaternion algebra would represent the autopoietic special system, the octonion algebra would represent the reflexive special system, and the sedenion algebra and above would represent the meta/infra-system or openscape. In other words for the system and meta-system there are corresponding levels of the hierarchy and for the three special systems there are corresponding levels of the hierarchy. Now the interesting thing is to study what each of these systems theories would look like based on the given mathematics which has been known for so long but the higher levels of which has remained more or less unused to study nature. We want to be very faithful to the mathematics in our construction of the emergent levels of our systems theory. That is we want the mathematics to drive our systems theory, so that we can encounter the nonintuitive aspects of the theory based on the mathematics in question. What we see when we look at the series of the algebras is something very interesting. At each emergent stage we are loosing properties. Going from real to complex numbers we loose continuity, and we loose the unity of the complements. Then going from complex to quaternion algebras we loose the commutative property. Then going from quaternion to Octonion we loose the associative property. Finally going from Octonion to Sedenion we loose the Division property. When we lose the unity of the complements and continuity get a strange kind of duality that appears in complex numbers, and which is useful for representing many different phenomena, like electricity for instance. But also these numbers are basic to our formulation of quantum mechanics and relativity theory both in different ways. But the point is that this is like the dissipative ordering special system because the cycle 1-> **i** -> -1 -> **-i** -> 1 is like the movement of the dissipative ordering special system, we see that in fractals which spread order in the complex plane. There is a strange thing about dissipative structures that order emerges from a singularity and spreads moving the boundary of the dissipative structure by reordering the background as it expands. This movement of order from singularity to boundary seems to be like a cycle that is being reenacted as the order spreads and the boundary expands, it is almost as if the ordering principle were circulating back from the boundary to the singularity to move out again in the next wave. All this reminds us of the cycle of the complex numbers between 1 and **i** in their positive and negative versions. It is this cycle that allows it to appear that there are perpetual information machines even if there are no perpetual motion machines. This is the basis on which Prigogine finds negative entropy systems, which generate order in far from equilibrium environments although they do not reverse the general direction of entropy. Order production is based on perpetual information creation such as we get in a strange attractor. When we move from the dissipative special system to the autopoietic special system which is the quaternion we loose the commutative property. This means that suddenly action becomes important because you cannot just reverse an action, but rather to reverse an action you have to take a round about route which takes extra energy. So when we move from the dissipative to the autopoietic then behavior becomes the key to understanding the autopoietic system. It

is created by conjuncting two dissipative systems. Each one is expanding in a different modality and by that they balance each other and produce a stable boundary. By producing a stable boundary it makes possible a unitary order at the organizational level despite change of components and the structural level. Autopoietic special systems are closed at their boundary, which means we never know how they are going to respond, that means we are looking at their behavior for a response. Also we know from the theory that we are expecting the cognitive and the behavioral to be fused in the autopoietic system so we can imagine one way that the symbiosis occurs is between dissipation at the cognitive level and dissipation at the behavioral level. In other words order is spreading both by the autopoietic system ordering its environment both physically and cognitively. So far we have at least a good story of how the hypercomplex algebras may be analogies for the Special Systems, but the key point comes when we move from the Autopoietic Symbiotic to the Reflexive Social levels. What is lost when we move from the quaternion to the octonion is the associative property. That means that the social suddenly becomes important at this level, that means who sets next to whom at the formal dinner party is important to how the party goes. Different associations mean different social arrangements which have different consequences. It is here were we see that the transition from one algebraic level to another mirrors the very characteristics we want to study which is the emergence of the social out of the organisms when we move from the autopoietic to the reflexive levels in our special systems theory. The discovery of this very close analogy is what made hypercomplex algebras interesting with respect to the formulation of the special systems theory. Suddenly we can see how by losing algebraic properties new emergent systems theoretic properties are created what are exactly those we wish to study. What we also notice is that the conjunctive way of relating things to each other again doubles at the reflexive level, so a reflexive special system is either two autopoietic special systems (individual organisms) or four dissipative special systems (dissipative structures). This gives us two ways of looking at the dissipative. So for instance we can view a marriage of two individuals as a conjunction of autopoietic systems (mysterium conjunctus in Alchemy, cf Jung) or we can view it as the relations between the two dissipative parts from each as forming a new dissipative conjunction. Thus the two cognitive dissipative structures can form a virtual autopoietic system and the physical dissipative structures can form a virtual autopoietic system and these virtual autopoietic systems can merge to form a reflexive social system, so we get a marriage of the minds and a marriage of the bodies as two new virtual autopoietic systems within the reflexive system. In fact, in general we can envision a chemistry of the special systems which form interesting juxtapositions via conjunctions of their various organizational elements. Finally what is difficult to understand now becomes clear because when we move from the octonion to the sedenion we loose the division property plus some others. But what happens when you loose the division property is that things become fused and you get a vision of interpenetration at the meta-system level. In fact this interpenetration is infinitely deep because not just the sedenion but all higher hypercomplex algebras like the 32nion or the 64nion etc all become models of interpenetration of things within the ultimate meta-system which models existence and can be interpreted as void or emptiness. These higher hypercomplex algebras also have structure all be it strange and weak, but still we hypothesize that at each level new properties are lost, more and more subtle ones, and that this means that there are emergent systemic effects at these levels that need to be studied and taken into account. It is this infinite shading off into the void or emptiness as inter/intra//penetration/surfacing that is how the hypercomplex algebras point toward the void. But this is not all because the actual structure of the algebras are a perfect model of interpenetration itself. In fact what we see is that the whole structure with all its emergent

levels is an image of interpenetration based on Aczel's Non-well-founded Sets. Each complex number is like a mirrored ball which is composed perfectly of the other mirrored balls of the other complex numbers and so on as deep as you like. The only caveat is that classes cannot be members of themselves directly. One only contains oneself though others, which is the basic law of interpenetration. So not only does the series reach fusion at the meta-system level but all the systems present models of interpenetration up to the level of the system or the real algebra. So there is a pointing at nonduality in two guises, the guise on nondivision or fusion and the guise of interpenetration. The guise of fusion is paradox and the guise of interpenetration is the suprarational. So by this twofold pointing at the nondual we achieve the fundamental goal of nondual science, a theory that is made up of the nondual that points at the nondual, and thus says what it does and does what it says, while at the same time telling us something interesting about existence and its emergent levels.

Because Hypercomplex algebras are complicated and their relations to each other and to other mathematical and physical structures are myriad we cannot go here into all the ramifications of these mathematical analogies on our Special Systems theory. Here we are only trying to suggest that these numbers are interesting and that their relation to Normal System, Special Systems and the Meta-system are worth pursuing. One reason for pursuing them is that they indicate that the Special Systems have strange properties which I call ultra-efficacy, which is ultra-efficiency and ultra-effectiveness together. These are the complements of the differing and deferring of differance what we pointed out with respect to the perfect, amicable and sociable numbers previously. That means that these system elude the pressure of entropy by some small random amount. That eluding of the pressure of entropy by compounding the negative entropy that appears in dissipative structures gives them a great advantage and that is what living things use to propagate themselves in every nook and cranny of nature. It is also these various levels of Ultra-efficacy that play a role in giving consciousness and the social as well as life their special properties. This ultra-efficacy which is hypothesized based on the mathematics of Special Systems should be an important testable hypothesis of the theory.

The key point here is that we take the mathematics of hypercomplex algebras and we try to construct a Special Type of Systems Theory based on the mathematical structures and follow out their non-intuitive results, and then we try to find the implications of these results and look for phenomena that fit these theoretical hypotheses or abductions. It turns out that the relations between consciousness, life and the social has certain relations that are similar to the nonintuitive results and their implications. The question then becomes how useful is this theory when it comes to describing these and other phenomena. In other words once we have a mathematically based theory it is necessary to apply it empirically to discover how useful it is in describing, explaining and predicting (proving) within a scientific framework. It is definitely a theory that has not been tried before. These mathematical objects have never been formulated into a special systems theory previously to my knowledge. The special characteristics of such a theory have not been recognized previously. The key to this is to see that a loss in properties in math is actually an emergent event in the systems theory. What appears like a loss in mathematics is really a gain in the systems theory. This only becomes apparent when you bring the two disciplines (mathematics and systems science) together in this way. And also it is only when you place the mathematics in a systems theoretic context that it is realized that the mathematics gives a model of the nondual. That is the really surprising result. No wonder that the hypercomplex algebras have not found a use as yet in physics or the other sciences, because they actually describe the interpenetration of things in nature (void) and within ourselves (emptiness). Interpenetration has no use, as such. It is the fountain head of meaning that

flows out of the nondual into our lives if we are open to it and oriented toward it and understand how not to confuse it with discrete experiences or cognitions. The series of hypercomplex algebras are that finger pointing at the void/emptiness of all things. The finger itself that is pointing at the fusion and interpenetration of the infinitely deep hypercomplex algebras from sedenions on is itself made out of that same material and interpenetrates itself. And thus the basis of our nondual theory is complete and is itself doing what it says an saying what it does and that is the kind of basis we need to construct a nondual science. The question only becomes how far can we take the mathematics once it is converted into a systems theory so its positive emergent side can be discovered.

Non-orientable Surfaces in Topology

With the Hypercomplex Algebras the main structures of the Speical Systems Theory in relation to Normal Systems and Meta-systems have been laid out. This is a strong structure which is not just anomalous but is very well defined if still quite strange. But when we see that structure then we can use it to recognize other mathematical structures that are similar. One example is the non-orientable surfaces in topology. These are the lemniscate, the mobius strip, the kleinian bottle, and the hyper-kleinian bottle. Each one appears to be locally but is singular globally except the lemniscate. The lemniscate is what you get when you cut a mobius strip down the middle in half. It is two sided and is associated with the real. Then we associate the mobius strip with the dissipative ordering special system, the kleinian bottle with the autopoietic symbiotic special system, the hyper kleinian bottle with the reflexive social special system, and there can be infinitely complex hyper-kleinian bottles, but we also associate the projective plane with the meta-system. In topology the non-orientable surfaces are an anomaly, and many theorists have shown interest in them, perhaps the most interesting is the work of Steven Rosen. He is the only one that I know who has treated them as a set and studied the transitions between levels and their implications. Here we do the same thing, seeing each one related to a different level from system to meta-system through the special systems. What the non-orientable surfaces tell us about the special systems are very different from what the hypercomplex algebras or the perfect, amicable or sociable numbers tell us. The mobius strip gives us a model in topology of the cycle we were seeing between real and complex numbers. It translates the differences into those between local and global and allows us to see the interaction between these two levels of analysis. What is interesting is that there is a relation between the key visual paradoxes and these various levels. For instance at the level of the mobius strip there is the old woman / young girl type of gestalt flip, at the level of the kleinian bottle there is the Necker Cube, and at the level of the hyper-kleinian bottle there is the tesseract or the hyper-cube in four dimensional space as warped when we look at two and three dimensional images of it. These paradoxical figures have an interesting trade off with the non-orientable surfaces which is explored in my paper “Deep Mathematics and Meta-systems Theory.” We will not go into those relations here. But it should be noted that paradoxical and suprarational images intertwine within these images of nondual science. Just as Being and Existence are intertwined duals so too are Paradox and Suprarationality. In the Mobius Strip we have sprarationality locally and paradoxicality globally in the same figure. But from a gestalt point of view we have the tensions between figures that will change between background and foreground in an instant, like a catastrophe described by Rene Thom. In the Kleinian Bottle what becomes unclear is the relation between inside and outside, also the relation between different representations of the bottle. There is also the question of the ambiguousness of the place where the bottle intersects itself. This is related to the Necker cube in as much as that is a higher level gestalt flip than the old woman and the young girl. There are specific nodes in the diagram where the flip of the Necker cube occurs when they are focused on and seen as foreground rather

than background. All this comes to a head when we reach for the hyper-kleinian bottle. That is formed by taking a figure eight shaped tube and twisting it 180 degrees and gluing it together. If we twist it 360 degrees we are back to a mobius strip. **(check this fact!)** If instead of we have a four leaf clover shaped tube and do the same twist of 180 degrees then we have a hyper kleinian bottle instead of a kleinian bottle. The hyper kleinian bottle has two kleinian bottles intersecting at their mutual circles of self intersection. By adding double lobes we can increase the number of kleinian bottles that are intersecting along the same circle by any number we would like. If we invert the infinite perspectives of the myriad self/other intersecting kleinian bottles then we create the projective space. In a projective space the three dimensional world is reduced to a line and then it goes back to a three dimensional space. This is like the inversion of the line of self/other intersection and the myriad bottles that are intersecting it. We take the non-orientable projective space as an analogy for the meta-system. There the relation is between one and three dimensions instead of two and four dimensions of the bottles. If we look at the circle of self-intersection itself it is one dimensional, and if we look at the bottles as self intersecting three dimensional rather than non-self intersecting in four dimensions then that gives us the transformation. All meta-systems have points of origin and sinks and the projection plane allows the origin and sink points to become the same. The projection plane gives us a picture of the arena of the meta-system and the surface of the projection plane is the boundary. What is outside the projection plane would be the source from which the system that enters the meta-system would come from which is not part of this representation.

When we accept the non-orientable surfaces as an analogy with the special systems it makes us think hard about their boundaries and the effects of local/global views on how we see the special systems. Realizing that the boundary of an autopoietic system is like a kleinian bottle helps a lot because it is clear from the theory that the surface of the autopoietic system has some odd properties. First of all that surface is created by the conjunction of two mobius strips. Mobius strips are built by gluing together a lemniscate which is two sided. Thus something being twosided is what is designated as real. When we enter the special systems we get odd properties related to non-orientablity. The dissipative structure uses that difference between global and local views to generate the odd relation between the singularity and the boundary that is moving outward converting the environment into its order. Globally there is entropy while locally there is negative entropy. But negative entropy is double edged because more negative entropy one place means more entropy somewhere else to compensate. It is this double edged nature of entropy which is like the double edged nature of the singularity which is the origin of order generation in the system and the boundary of conversion. The conversion boundary is always bigger and bigger but from the beginning it is bigger than the singularity where the order production comes out of nowhere into the center of the dissipative structure. If we see the relation of the dissipative system boundary to the singularity as being like the relation of the projective plane's 3d part to the 1d part then we can see how the boundary might be connected to the singularity from a meta-systemic point of view. But the actual movement of order from the singularity to the boundary and perhaps though a phasespace back is more like the mobius strip in as much as there is a cycle of information propagation which is nondual. Non-dual means not one! Not two! The mobius strip is two sided two boundaried locally but globally it is one-sided one boundary. In other words the mobius strip is a model of what non-dual could mean, something other than two or one. At each level of the hierarchy of non-orientable surfaces we are looking at models of what nonduality might be like. The lemniscate is dual sided, but when it is glued together as a mobius strip then it becomes a model of nonduality. The dissipative system has at its heart a type of nonduality of information. The information that specifies the order that is

flowing out from the singularity not only specifies the organization within the boundary, but also contains the procedure or functionality of reorganizing the environment to become part of this new negentropic ordering. But at the same time it is creating disorder in the surrounding environment which it is then reordering. So the ordering of the dissipative structure is at the same time a disordering of the environment, and because the singularity is smaller than the boundary the amount of disorder created outside the expanding boundary is always more that the amount of order created inside the boundary. So creativity is always also destruction as Nietzsche remarked. They cannot be separated. But there is something about the dissipative system which is not just ordering and disordering. But instead it is as if the order were flowing out from the singularity to the boundary and then back to the singularity to appear again though a phase space. The order becomes disordering at the boundary and then at the boundary vanishes into the phasespace in order to reappear at the central singularity again as new ordering. Locally at the boundary it looks as if order/disorder are different, but globally it is the same flow that is both ordering and disordering. So the flow itself that appears as an infinite information machine, especially if it is hooked to a strange attractor, is somehow something else that is nor order nor disorder but part of an infinite cycle from singularity, to boundary, back to the singularity though a potential trough. This complex that produces negative entropy, that escapes entropy locally but not globally, is neither ordering nor disordering but something else, more like a perpetual information machine driven by a strange attractor.

So let us move to the level of the autopoietic special system and the kleinian bottle. The bottle makes amorphous whether or not something is inside or outside the bottle. It also makes amorphous the circle of self-intersection, and thus establishes a reflexive structure for the first time, by which the autopoietic system can identify itself. The kleinian bottle is produced out of the conjunction of two left and right mobius strips (**check fact!**). Globally on the surface you cannot tell inside from outside. But locally there is a clear difference between inside and outside surfaces. So here there is nonduality with respect to inside and outside. The Kleinian bottle is not inside! Not outside! But something else. The Kleinian bottle is that something else as an anomaly. What is interesting is that in three dimensions the ambiguity of inside/outside opposites goes with self-intersection. But in the fourth dimension that self intersection is not necessary. The fourth dimension specifically allows the kleinian bottle to be whole without self intersection. So the bottle form calls into question what dimension it is in, the third dimension or the fourth dimension. The bottle actually inhabits both dimensional regions and this needs to be taken into account as we consider the bottle. There are also two forms of the bottle in the third dimension, the normal view where the bottle has a neck that goes back though itself to connect to the hole in its base. But there is a different form which is a figure eight “8” tube that is rotated 360 degrees and then glued together. These are two images of the four dimensional form of the bottle that uses the extra space in the four dimension to pass inside itself without crossing its boundary. So the bottle is also ambiguous as to whether it is a three or four dimensional form, and then we must consider the ambiguity as to the representation of the bottle in the third dimension. All these are a lot of ambiguities that are encapsulated in this form that has inside/outside locally, but that globally cannot distinguish between inside and outside because it is one surface. But it trades that inability to distinguish between inside and outside for the distinction between the self-crossing area and the rest of the surface. That self-crossing area can be seen as producing the ego of the bottle, the circle of self intersection which is the center of the whole surface. But this self-crossing ring vanishes if the bottle inhabits a four dimensional space rather than a three dimensional space. The surface or boundary of the autopoietic system has these strange nondual properties with regard to inside and

outside. This is something little appreciated in the standard autopoietic theory of Matarana and Varella. Rather they talk about other nondual properties like the inability to separate cognition and behavior. But they don't realize that the nonduality of the autopoietic system is so pervasive that it effects the boundary itself. The boundary of the autopoietic system is what contains its organization, but it is also permeable at the structural level. But this is another nonduality because it is neither permeable or nonpermeable. That is why they talk about perturbations but say that the perturbations do not determine the causality within the boundary which is closed. Having a specific model of nondual otherness like these non-orientable surfaces really helps make nonduality extremely precise in terms of these analogies. We can see that they are odd structures that if they did not exist we would be hard pressed to imagine them. We can apply these nondual examples to understanding all the various dualites related to the special systems and the higher we go up the chain the more nondualities are added that can be analyzed by these anomalous topological analogies which have a very definite form but which must be analyzed to see how they apply in each case.

At the reflexive level the interesting thing is that we construct a figure which is like the klienian bottle but it is actually two bottles with intersecting self-intersection circles. Thus self/other becomes ambiguous at the reflexive level not just inside and outside the self. This is an analogy for the social field as described by reflexive social theory, which is nondual. It is something "other" than either self or other. That otherness is embodied in the the figure of the hyper-kleinian bottle. We can multiply the number of intersecting bottles by adding new "8" figure eight tubes around a central circle of self-intersection which is the same for all the member bottles. What is interesting is that the very reflexive self-intersection of the bottles that gives each bottle its ego also is the place of intersection with the other so that self/other becomes ambiguous. When we analyze how this situation would look in a four dimensional model we find an interesting formation which is too complicated to talk about here. But you can see something of this analysis in my paper on "Deep Mathematics and Meta-systems Theory" and my paper on "The Possibility of a Reflexive Social Theory." But what is interesting is that this topological model gives us some clue as to the nature of the nonduality of the social field. We notice that reflexive self consciousness comes about in the Kleinian bottle and its self intersection. Social consciousness is produced at the reflexive level that allows mindreading or theory of mind, i.e. acting as if we could read the minds of others in social situations. That means consciousness itself appears at the dissipative level, and is actually associated with the intentionality of the movement of order from the singularity to the boundary. What Husserl calls the intentional morphe which organizes the hyle can be seen as a model of the ordering function that reorders the environment as it expands. We experience that expansion as time. When we combine expansion in space with expansion in time within a spacetime continuum then we get the stable boundary of the autopoietic system. It actually contains two dissipative cycles in it, which are seen as four at the reflexive level. At the reflexive level we get virtual formations of the dissipative cycles that interact in ways that are not tied to the mind/body relations of a single individual any more, but allow mind/mind and body/body autopoietic formations. The study of reflexive sociology is something that needs to be given more attention. All of the special systems are nondual and the nonduality of the dissipative structures and the autopoietic symbiosis is easier to understand than the nonduality of the reflexive social field. The analogy of the hyperkleinian bottle is a way to make that nonduality more concrete to our imaginations by way of analogy with these topological anomalies. The hyper kleinian bottle is a form that I worked out on my own in order to extend the kleinian bottle to this higher dimension and I have not seen it discussed by mathematicians in the literature.

There can be infinite number of kleinian

bottles that intersect with each other along the same circle of self/other intersection, and this is how we share our bodies within a mutually constructed world along the lines described by Merleau-Ponty and Samual Todes. But we also have a model of the meta-system as nondual in the projective space. There we move from one dimension to three dimensional surface and that shows us the relation between the singularity and the boundary in the case of the dissipative system, but also it applies to the autopoietic system and the reflexive system. With respect to the autopoietic system there is the relation between that system and the surrounding space. That system comes from an origin and returns to a sink, and it has a genetic unfolding, so the projective space is that space of unfolding for the autopoietic system. But on the reflexive level there is an inverse relation between the infinite klienian bottles and the circle of self/other intersection and the projective space. The projective space can be seen as the inverse of the bottles around the circle. The projective space goes from one to three dimensions and the bottles around the circle goes from two to four dimensions. Thus they are dimensionally offset from each other and in that way duals of each other.

The key point of the topological analogies is that they provide a concrete representation of forms that are nondual in themselves. Nonduality is made concrete by these analogies and when we apply them to the special systems we realize how deep the nonduality of the special systems is in as much as they are formed by these nondual relations at each level and that there are emergent properties associated with that nonduality seen in the figures. With these analogies the idea of the special systems being representative of nondual ways of looking at things is concretely represented. The analogies apply to more kinds of duals than appear in the topology, and so we have to use the hints in the topology to reason bout the application of this analogy to other types of opposites that appear in the special systems theory. But we hypothesize that the special systems are thoroughly nondual and that all duals that are used to represent them are similarly nondual in essence.

Solitons

The next anomaly we will mention are the solitons. There are solution solutions to many physical equations. Solitons appear as hump-like waves in troughs. But they have odd ultra-efficacious properties like bouncing off walls without losing any energy, passing through each other without losing energy, the ability to travel unusually long distances conserving their form and energy. It is solitons that give us a view of the ultra-effacaciousness of the Special Systems, ultra-efficaciousness means ultra-effective and ultra-efficient at the same time. This is the flip side of the differing and deferring of Differance that we saw in the perfect, amicable and sociable numbers. Difference is a term coined by Derrida to talk about what we call Hyper Being. Solitons are also the model of the cyclical view of the dissipative structures. It is by the reflections and reconstitution of the wave off the bottom and sides of the trough that the wave keeps going. So the wave efficiency and effectiveness is directly proportional to the smoothness and continuity of the trough that it is flowing through. As long as the soliton holds its form it maintains is ultra-efficaciousness. So the system is the trough with normal waves in it. These normal waves are perturbations that can destroy the form of the soliton wave and cause it to deteriorate. The open sea is the meta-system, i.e. a body of water with no troughs. Although we must recognize that thermal inversions can create the conditions in which solitons may form within open bodies of water. Also they have been observed in the atmosphere over Australia. The point is that the soliton is almost the perfect model of a dissipative structure as a cycle. In this case the order is the hump-like wave itself, which is maintained with respect to the surrounding water level. The spreading of the boundary is the forward motion of this wave. But the ultra-efficacy is the power of the wave to conserve its energy, to bounce off of things without losing energy and the ability to pass through other solitons without losing

energy. And it is the circulations of reflections of the wave between the boundary of the trough and the soliton itself that produces these effects. This is what leads us to hypothesize that dissipative structures in general are cycles of order through a potential trough from boundary back to singularity as well as the more obvious outward flow of ordering. Solitons in magnetism are also called monopoles.

But strangely there is also the next higher level soliton complex that is called a breather. A breather is a positive and negative solitons falling into each other. A breather has a stable boundary like an autopoietic system. It has a heartbeat of the two solitons falling into each other. A breather is a perfect example of the inner dynamics of the autopoietic special system. It shows how two dynamic dissipative structures of opposite poles can be combined conjunctively to create a higher level organized dynamic object that is static. The breather is it own trough, and does not need a trough to sustain itself.

We hypothesize that there is a further higher level structure called the super-breather composed of two breathers. These are like two autopoietic systems that form a reflexive special system. We hypothesize that we can connect these two breathers at a distance with the exchange of instantatons and thus get action at a distance within a reflexive autopoietic system. This shows us a way for information to flow as if by popping in and out of existence at a distance within the autopoietic system thus creating something like quantum tunneling for the instantaneous passage of information through out the reflexive social system, this is what could be the physical basis of mindreading or theory of mind sorts of behavior where it appears that within a reflexive social system the two partner systems were reading each others mind, as if they were within each others mind. Instantaton exchange is a way for information to pass from one autopoietic system to another without breaking the boundary of the system itself exchanging instanatons through potential troughs. Notice that this is an example from physics but it has the same sort of emergent layering structure based on conjunction of lower forms in perfect balance to create the more complex forms. We use the soliton to show that dissipative structures as special systems exist in nature. In fact they are very abundant possible in nature although rarely observed.

Superconductivity

The physical example for the autopoietic system is superconductivity. It was an anomalous discovery that took twenty years for a theory to explain. Finally the scientists have developed the theory of cooper pairs. Now there are suggestions that perhaps the cooper pairs are even macro examples of entanglement. If this is true that has great implications for autopoietic systems because we would infer from this that all dissipative structures that are in an autopoietic system as a pair are entangled, this would mean there is also entanglement acting in the reflexive special system as well. Be that as it may there is now the theory that there are phonons which are lattice shaking pulses that are exchanged between the paired superconducting electrons. The pairs of electrons navigate the lattice of the superconductive material exchanging information about what imperfections in the lattice they encounter and they somehow pull each other away from those imperfections so resistance drops to zero, and that leads to some very anomalous phenomena. This is one of the proofs that Special Systems based natural phenomena are ultra-efficacious. We expect to find many such ultra-efficacious phenomena in nature once we learn how to see them. As for now the prime example of a system that is like an autopoietic special system is the super-conducting cooper pairs.

Bose-Einstein Condensates

The physical phenomena that is like the Reflexive special system is the Bose-Einstein condensate recently produced in the lab. It is a new form of matter that displays macro quantum mechanical effects. This is like the

reflexive system because whole atoms become part of the condensate which is fused, but which will exhibit the interference effects seen in light in a system with mass. When such a mass is made of a million sodium atoms say then the condensate will lase out whole sodium atoms. Thus the condensate does not forget that it is made up of whole sodium atoms even though the condensate acts as if it were one body. Thus it is something that acts like the social field which is made up of individual humans, or other animals that are social, but that when they enter into a resonance with each other become as if they were one. Cannetti describes this very well in his Crowds and Power. George Leonard describes it in The Silent Pulse. There is also the book Sync by Steven Strogatz. Resonance is an important phenomena in nature. And the condensate shows that physical matter can be nondual between a state of fusion and nonfusion. In the condensate there is a quantum mass which still remembers that it is made up of individual atoms. It sows that quantum phenomena can occur at the macro scale. And this is a key assumption of our research, which is that Quantum Mechanics describes the whole of reality not just the micro world. The fact we do not see that quantum weirdness is because we project Being that covers it up, but the quantum weirdness is the interpenetration of the whole of the universe. We can see that in Bells Theorem, which has been proven, that strange action at a distance between particles is possible if the particles have ever been entangled near each other. Since the whole universe resulted from the Big Bang that means all the particles in the universe are entangled, and that is the physical explanation of interpenetration which is the fundamental nondual reality. But that nondual reality shows up in complementarities because it is not one nor the other but neither and both as the tetralemma would say. That is to say that phenomena are wave or particle depending on the observer and what experiment he does, but that means that the real phenomena itself is something else besides wave or phenomena which are projections we make on the otherness of the nondual.

Review of Anomalies

Notice that there are multiple anomalies that single out the specific emergent levels of the Special Systems. Each one brings out a different feature of the various special systems. Sometimes the various levels work together to describe a single level at the same time. But what is interesting is that the anomalies fit together to give us through their conjunction a very precise picture of the characteristics of the different emergent levels and their relations to each other and the gaps between them including the criterion for jumping to the next level through an operation of conjunction. We have not just mathematical examples but also a set of emergent levels from physics in the soliton, and besides that specific unique physical phenomena that exemplify the structures of the special systems in the soliton, superconducting cooper pairs, and Bose-Einstein condensates. Thus with this combination of mathematically based theory and in disputable physical examples this makes this theory of Special Systems a fully Scientific Theory in every sense of the word. This sets the theory fully within the realm of Western Science. It has a status even better than String theory because we have physical examples of such anomalous systems that exist in nature. But also we can see from our examples that they exemplify nonduality at each step of the way. The more anomalies we add the better picture we have of nonduality. And we believe that there will be other anomalies found to add to this list which will specify even finer levels of detail about the special systems once they are located. Even other physical phenomena may already be known that exemplifies these structures. But even though some may be known, because of the paradigm, episteme, and ontological shift involved in this expression of nondual science, others will surely be found once we know what sort of shape of the phenomena we are looking for and we begin looking at the universe with new eyes seeing Normal Systems, Special Systems and Meta-systems throughout nature, hopefully in the near future as scientists learn

about this new way of looking at nature based on it's inherent nonduality. They have discovered piecemeal nondual phenomena by accident. This is a unified theory of what nondual phenomena looks like and once we use it as a schema we should be able to recognize other nondual phenomena either already discovered or newly emergent based on the new theory which will allow the scales fall from our eyes as we look at nature anew in the light of pervasive nonduality.