General Schemas Theory and the Pascal's Simplicies

The Advance of the Systems Engineering Discipline through an extension of Systems Theory

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This paper is dedicated to George Redpath who died unexpectedly on October 22, 2003. He was my teacher and friend. The world is at a loss due to his absence from it. There is a good chance I was writing on a draft of this paper when he died.

Introduction

In the last paper in this series we considered the impact of negative dimensions on the definition of the Schemas. We outlined a very broad theory which mentioned the role played by Pascal's Line, Triangle, Tetrahedron, Pentahedron, and other Simplexes, or in general the Pascal Simplicies. In this paper we will focus in on the role played by the Simplicies and the idea that the Geometric Simplicies define a series of emergent jumps as the Pascal Simplicies unfold which helps us understand better their role as the inverse of the schemas as a representational mathematical hierarchy. In other words we are not defining the emergent hierarchy of the schemas per se but instead are defining an emergent hierarchy that is somehow perhaps the dual of the schema hierarchy but which seems to have the property of emergent jumps at each level like the schemas do. The Simplicies are important because as we noticed in the last paper they are dissipative ordering, autopoietic and reflexive at the same time. All other models we have proposed for the Special Systems have had separate layers for each special system with clear emergent jumps or discontinuities between them. But in the Pascal Simplicies we find a mathematical form which may be unique in as much as all three Special Systems Properties inhere in the same structure. Thus it behooves us to explore this structure even if it was not important for the definition of the schemas just because it is yet another image of the Special Systems. We noted that the schemas are limited by the dimensional unfolding that is seen in the Pascal Triangle which defines each simplex, simplest regular Platonic polytope, of each dimension. Then the Pascal Simplicies unfold into the Geometrical Simplicies that are defined by the Triangle. This laying down of a geometrical template and then filling it with a tetrahedral array of numbers is seen as an aspect of self-production. Self-production must occur by first writing down the design and then constructing oneself to fit that design. So the Pascal Triangle produces the Template that the Pascal Simplicies then fill. This is the aspect of the Pascal Simplicies that we see as autopoietic. We see the production of each new configuration element in the expansion of the point, to line, to triangle, to tetrahedron, to pentahedron as dissipative. And we see the different mirrorings that produce interesting patterns within the various configurations as the reflexive aspect. For instance the Pascal Line in all cases acts as a one sided mirror. But at the center of the Triangle is a two sided mirror. We hypothesize that related to the Tetrahedron is within a three sided arrangement of mirrors. In other words it is as if the tetrahedron were expanding in a mirror configuration whose sides as Pascal lines are expanding with it. Or perhaps the points are getting smaller and smaller. We further hypothesize that the Pascal Pentahedron relates to four mirrors of four dimensional space. I have not yet figured out how these mirrors are configured to produce the tetrahedron and the pentahedron. The key point is that we can see the mirroring at the reflexive level in the structure Pascal Simplicies. They are dissipative, autopoietic and reflexive at the same time. It is already well known that the Pascal Triangle has many strange properties and we assume that the higher level Simplicies now mostly unstudied will also have very interesting properties. For instance the properties related to the distribution of primes and pseudo-primes that form patterns[1]. However, here we are interested not so much as individual interesting features but rather global emergent features of each Pascal Simplex. There is a question whether this increase in global emergent features goes on forever or stop after some time. Our hypothesis is that it does not go on forever just because it is tied to the infinity of dimensions whose properties keep changing as we enter higher and higher dimensions. However, it could be like the volume of hyper-spheres that after the seventh dimension or so where their volume becomes smaller and thus the emergent properties mail trail off. They could very well be like hyper-complex algebras that it trails off after only four levels, or perhaps there is a phase change about level nine to coincide with the end of the schemas. It is not known how many emergent transitions of significance there are before the series of Pascal Simplicies becomes strongly supervenient and the emergent properties end. In this essay we will pursue this question as best we can given our finitude and the low dimensionality of representations we can comprehend.

Emergent Levels of the Pascal Simplicies

So we will start with Pascal Simplex level zero. It is of course odd zero. It is void. It has no properties as such. Then we graduate to Pascal Simplex level one which is the number 1 by itself. The emergent property produced is unity as an oddity out of nothing. Then we graduate to Pascal Simplex level two which is a line of ones. What is added are the discontinuities between the ones, or repetition as plurality. What is emergent here are the discontinuities. We can map the integer line to this line of ones by picking an origin discontinuity, and counting positively and negatively from that origin. If we apply both addition and subtraction to the Pascal Line then we get the integer line. Next we graduate to Pascal Simplex level three which is the Pascal Triangle. This is a generalization of the interger line and we see it as having a positive and negative hour glass either side of odd zero. Now we count lines in the Triangle rather than ones. There are two Pascal Lines that cross at odd zero. Between the lines there is produced a series of 2^n systems. It is as if each one in the line opened up into a binary lattice and the two images of the one became the limits of each binary lattice. But what is interesting is that these individual lines define the geometric simplexes, that is the simplest

[1] Jim Nugent "Pascal's Pyramid Or Pascal's Tetrahedron?" http://buckydome.com/math/Article2.htm

Platonic solid in each spatial dimension. This series of geometrical simplexes becomes the template for the expansion of the Pascal Simplexes that fills the geometrical polytopes with Pascal tetrahedral number lattices. So at the third emergent level there is a precursor template for all the future emergent levels. Then, we graduate to Pascal Simplex level four which is the Pascal Tetrahedron. If we look at the work of Nugent[2] we can see that there are interesting patterns of Primes and Pseudo-primes. These also occur at the level of Pascal's Triangle where the number of primes in a line as far as we know are always divisible by two. Within the Tetrahedron the analog property produces patterns within the expanding tetrahedron that are shown by Nugent in a visual simulation. There are two mirrorings in the triangle. One mirroring is at the Pascal Lines and the other is a two way mirroring at the center of the triangle. These two mirrorings emulate the reversibility of the spacetime interval where the one mirroring coincides with the limits of the interval and the other two sided mirroring corresponds with the chiasm of reversibility between the phases of the interval. Unlike the spacetime interval this interval is not asymmetrically broken in a 3+1 pattern but is still balanced prior to asymmetrical breaking. We posit that at the tetrahedral level there are three mirrors. These mirrors appear as the Pascal Lines of the expanding tetrahedron that is emanating from the origin which is centered between the three mirrors. The mirrors seem to be expanding in lock step with the expansion of the base of the Pascal Tretrahedron. The emergent property of the Tetrahedron is the expansion into three dimensional space and the addition of a third mirror. The resolved interference pattern between the mirror surfaces appears as the pattern of primes. Then we graduate to Pascal Simplex level five which is the Pascal Pentahedron. This level adds another mirror and another dimension for the simplex to expand into. Each pentahedron is created with five tetrahedrons in a four dimensional configuration. With this fourth mirror we are seeing an emulation of the inwardly mirroring tetrahedron of the reflexive social level of the Special Systems Theory. The four mirrors are the four independent axes of four dimensional space that are configured to rotate as a quaternion. In that space the hyper-sphere has two independent circles. The pentahedron contains two mobius strips that are intertwined to produce a kleinian bottle. Each of these independent circles can inscribe a kleinian bottle so that we get the hyper-kleinian bottle as a result that corresponds to this level. As you can see we are tracking the levels of mirroring represented by the Special Systems, the levels of the expansion of the Pascal Simplex and Geometrical Simplex, as well as the topological series of mobius strip, kleinian bottle and hyper-kleinian bottle. Things are starting to get confusing. However as each element that comes into the synergy gives us another emergent characteristic to consider. The question is what happens at levels six and seven and eight, etc. Does the series continue to have strong emergence of new characteristics or does this trail off into mere strong supervenience as with the Hyper-complex algebras. In other words does the Strong law of small numbers apply in this case. Meaning that because there are too few small numbers they get reused in pseudo sequences synergistically and that this effect has a finite limit as the number of numbers available increases with higher dimensions.

[2] Jim Nugent "Pascal's Pyramid Or Pascal's Tetrahedron?" http://buckydome.com/math/Article2.htm

Pascal's Simplicies unfold toward infinity. At the lower levels we can understand there are some very interesting associated emergent properties. The question is open whether this series keeps produce strong emergent effects as it continues toward infinity. One hypothesis is that the emergent effects are aligned with the hyper-complex algebras and that there is a continual loss of properties. Here we will explore this possibility in lieu of further research into the properties of Pascal Simplicies. My hunch is that emergent properties keep occurring as we go up the hierarchy, but so little is known about even the third, fourth and fifth levels that it is difficult to give even an educated guess. But lets assume for the moment that the Pascal Simplicies at least act like the Hypercomplex Algebras which are the basis for the structure of the Special Systems.

Simplicies and Hyper-complexity

The Hyper-complex algebras start at real numbers and progressively lose properties as we go through the Cayley-Dickson process that generates each successive Imaginary level. The reals are one of a series of constructed numbers starting with zero, then the natural numbers, then the integers, then the rational numbers, then the reals as irrational and transcendental numbers and finally the various imaginaries. These various numbers are generated by mathematical operations, as the solution of various problems in calculation. But this genesis from calculation causes them to be fragmented into different kinds. The opposite of this is the surreal numbers which are generated from one general rule and thus generates a complete number system in one fell swoop that is unified. Surreals include infinities and infinitesimals as well as holes. We cannot integrate with surreal numbers and thus they are discontinuous rather than continuous. We have already suggested that the Pascal Simplicies are a generalization of the integer line and thus they connect the integers from the normal numbers too the surreals which are produced by progressive bisection and that connects to the 2^N binary systems generated by the Pascal triangle. So imaginaries are one departure from the normal number system and Pascal Simplicies are another departure. Normal numbers are of different kinds whereas the surreals act as a mass of arrows pointing up and down. Between the Set and Mass approaches there is the ipsity of conglomeration that is non-dual between set and mass. The Pascal Triangle represents that ipsity of conglomeration. The ipsity has neither too much difference like the set nor too much similarity like the mass. Instead, it has just the right amount of difference and similarity to be balanced between them and non-dual because it comes before the differentiation of nihilistic opposites. The ipsity of conglomeration is like Vishnu of India, Hun Tun of China, or Albion of Blake's Europe in relation to the nihilistic extremes of Dionysus/Shiva and Apollo/Brahman. Vishnu is related to the *Bheu root of Being which stands within the enframing of *Es/*Er//*Bheu//*Wes/*Wer. As we study the Pascal Simplicies we come to appreciate more and more their fusion of the properties of the Special Systems and the way they embody non-duality. We must admit that they are generating all possible systems. This is because each simplex generates an $\mathbf{n^n}$ possible combinations of things at any particular level of configuration. Possibilities always precede actualities. So right there we can see the Pascal Simplicies acting as a schema. The Pascal Simplicies expresses all that is not given as possible systems because it always remains $\mathbf{n^n}$ against which what ever selected possibility is put forward. The power selects the dimension of the simplex and the power selects the level of that simplex within the hierarchy of Simplicies at that level.

As we move through the Simplicies we always have a reference simplex. We enter the dimension of a simplex by generating this reference simplex from the last reference simplex. So for instance, the reference simplex for the Pascal Triangle is the line 1331 which describes the Pascal triangle itself. When we enter the new dimension there are two directions to go from the reference simplex layer. Once may either go toward the vanishing point of the new dimension, which in this case is filled in by the layers 121 or 11 until we get to the vanishing point of 1. Or we can go toward infinity by continuing the series 14641 and 15101051, etc. When we move to the level of the tetrahedron we move up one layer to the new reference layer 14641. Then we can expand toward the new vanishing point by following the tetrahedral 2d layers back to the vanishing point or again head out to infinity. When we move out to the pentahedron we again move down a layer in the Pascal triangle but this time we get a whole tetrahedron, and we can trace that back through a series of smaller and smaller tetrahedron to their vanishing point or go onward adding tetrahedrons to infinity. See how we are moving out once reference layer at a time, and then projecting in the new dimension a new point of view and adding in the layers it takes to obtain that vanishing point to give us the filled in elements of the Pascal Simplex at that level. If we go toward infinity rather than zero we continue to expand forever within the same dimension. Setting back each reference layer related to each simplex in order, causes us to produce a multidimensional tetrahedral grid proper to that dimension building only from the reference layer of the old simplex to produce the new reference layer of the new simplex. To get the full simplex we have to project a vanishing point in the new dimension and then fill in between the reference layer and the vanishing point to get a filled in Pascal Simplex. The line of reference layers snakes back into the higher dimension defining much with a minimal set of information in each case. The Pascal Simplicies are always choosing the right distance between finitude and infinitude in each dimension that is minimally necessary to define that new dimension. Thus we can see that the Pascal Triangle which includes the Fibonacci series as one of its shallow number fields cutting through layers of dimensional numbers. But the Simplicies themselves are performing a similar service in attempting to gage the right amount between finite and infinite. It is enough to make you wonder if the Pascal Simplicies have some function at the non-dual level of the Good, of Fate, of Sources, and the root as well. For instance, from the point of view of the Good the Pascal Simplicies are producing the template of possibilities for every possible system. Good is defined as Variety generation. The Pascal Triangle is generating Variety. The Pascal Triangle is operating inside the Pythogorean Tetrakys. The Tetrakys defines when multiplied defines the various modalities of the monolith of Being. In this sense the Tetrakys defines the generation of kinds from the unkindness of existence. The Tetrakys defines the twenty four combinations of the kinds of Being to form the various exotics. It turns out that there are twenty four combinations of the accouterments of Vishnu that he holds in his four hands in various combinations. If we consider the projection of Being to be fated we could see the unfolding of the multilith as an expression of the demarcation between Existence and Being. With regard to the sources we have already mentioned that we think they exist in negative dimensionality and that the threshold between existence and Being is between positive and negative dimensionality. Slowly we see that the Pascal Simplicies could stand for all the non-duals within the Western Worldviews. Non-duals connect surreptitiously nihilistic opposites otherwise seemingly cut off from each other. With regard to infoenergy and entropic-matter we can think of the fact that all possible coding is defined by the Pascal Simplicies as well as all possible configurations of things seen in combination. Information is a selection of possible messages to give surprise. Entropy is the disruption of those messages. Energy is the medium for the movement of those messages. Matter is the storage facility for that information. When you start thinking of configuring minimal storage for information in matter then ones thoughts immediately return to the possible patterns generated by the Pascal Simplicies. If the Pascal Simplicies are the structure of the non-dual core of the Western Worldview at all the different levels of articulation of nihilistic opposites and non-duals then that would make the Pascal Simplicies a pivotal ordering regime. Not only is it ordering dissipatively, exhibiting autopoietic and reflexive characteristics in fusion but it is suggestively ordering in such a way that it operates at each level of non-duality within the western worldview simultaneously. It is like an Archimedean fulcrum. This concept will take some research to establish. But for now we can recognize that it is definitely playing that role at the level of ordering which is between Physus and Logos where our main concern lies. It is basically defining the possibilities of all possible orders of the form $\mathbf{n^n}$. We have noted previously that $\mathbf{2^n}$ and $\mathbf{N^2}$ is the difference between quality and quantity. $\mathbf{2^n}$ describes Venn diagrams where functions interpenetrate. $\mathbf{N^2}$ Diagrams define the external relations between things. There can only be as many qualities as there are possible interpenetrations of things. There can only be as many quantities as there are possible relations between things. But note that both draw from the Simplicies. So we can see that the difference between quantity and quality is defined internally between different aspects of the Simplicies. Is this true for the other categories as well? For instance part/whole relations. The Simplicies define all possible part/whole relations. For instance, every layer in a Pascal triangle is a Boolean system. Each combination of bits is a possible element. Etter would have us mark these possibilities with positive, zero, negative and imaginary counts in his Link Theory. Then all the groupings of elements that appear together as a node in the Pascal triangle layer are the possible combinations of elements that might be intermediate parts between the element and the whole. So we can see how the Pascal triangle contributes to another of the Kantian Categories. The whole question as to whether there is a fulfillment of the Kantian Categories and their Schemas by the Pascal Simplicies is very intriguing.

Pascal Simplicies and Kantian Categories and Schemas

The Kantian Categories are derived from the Aristotelian Categories but tailored to underpin Newtonian Science. They are first divided into four and then each of those is divided again into three, but some of those divisions are pairs instead of single concepts. The first major division is into Quality and Quantity and then the second is into Relation and Mode. Each of the categories are associated with a schema that temporalizes them. Within Quantity there is Unity, Plurality, and Totality with the schema of time series.

When we look at the Pascal Triangle we see that everything comes from the articulation and differentiation of one and thus it is the unfolding of unity that gives rise to the Pascal Simplicies. Plurality occurs by the unfolding of the various Pascal Simplicies into a series of elements made up of groups of bits. But each layer in the Pascal Triangle is a system of elements of a certain order of bits. Each layer is a Boolean system in the Pascal Triangle. But ultimately we are talking about n^n systems when we bring the Simplicies into play. The time series occurs by the generation of additional layers by addition of elements diagonally from the last existing layer. This works like a one dimensional cellular automata unfolding in two dimensions. The dissipative growth of order produces the timeseries by the expansion of the Simplicies. Quantity is of course N^2. That is it relates to the things divided by the possible external relations between things. We have posited previously that rather than the dialectical relations between the categories we should rather see them as a Greimas square which produces the non-dual of wholeness. Wholeness can be divided into those things greater, equal or less than the some of the parts. Wholes equal to the sum of the parts can be divided into dissipative, autopoietic and reflexive special systems. Thus we see a way to begin with the Kantian categories that relate part to whole and produce an image of the special systems. But with respect to the Pascal Simplicies we are saying that they fulfill the necessary characteristics of the Quantity quadrant of the Kantian categories.

The next quadrant of the categories is Quality and that is made up of Reality (fullness), Negation (emptiness), and Limit (degrees). We can relate the fullness of reality to the interpenetration of things in a Venn diagram like fashion. Quality is 2^n. If we see interpenetration as fullness, then we can see its negation as emptiness. This brings into view our concept of the positive and negative Pascal Triangles, and therefore Simplicies, We have already posited that negative dimensions are related to the hyper-complex algebras. So the positive dimensions are related to the emptiness of space but the negative dimensions are related to the emptiness of interpenetration. Interpenetration is fullness compared to the emptiness of space. Space is fullness of a plenum in contrast to the seeming non-existence of negative dimensions. Both positive and negative dimensions can be characterized as empty or full depending on one's perspective. But the unfolding of the Pascal Simplicies produce dimensions which are limiting horizons. These dimensions serve as fundamental degrees with respect to the characterization of things. Our mathematical and geometrical schemas described by Umberto Eco arise from them. The time content is related to this question of whether space is empty or full as it is related to time. In other words just like space can be empty or full so can time. Problem is that time is one dimensional and space is three dimensional and together we now realize since Einstein spacetime makes a four dimensional plenum rather than having absolute space and time as Kant and Newton imagined. Space and Time are fused into the matrix of Spacetime or Timespace. In the Buddhist sense reality can be seen as emptiness and interpenetration, or we can take reality to be the mundane world in which case it is what occurs in spacetime in which case the negative dimensions are somehow unreal as they are to us today.

When we move away from Quality and Quantity quadrants into Relation and Modality we enter a different territory which is more complex for Kant. But here to we can also see how the Pascal Simplicies fulfill the necessities of the Kantian Categories. The relation categories describe the kinds of relations that things can have with themselves and each other. The first relation has to do with properties and the substances that they exist in relation to. This is signified by a dualism between substance and inherence. Substance is the material body and the primary qualities and then the secondary qualities inhere in the material body. This is one of the bases of Newtonian physics. This is a stance that has been developed throughout the history of western essentialist metaphysics starting with Aristotle and followed by almost all the Western philosophers from that point. It is precisely here that Plato and the pre-Socratics may have departed from this set based approach to things into a mass based approach to things. Inherence is a lot like pervasion of its instances by a Mass. If the Platonic Forms were thought of as Masses then Platonic Ontology becomes much more simple and straight forward. The phase change from a Mass approach to a Set approach is seen to happen with Aristotle who defined the possible sentences one can posit about anything and called them the categories. Kant is basically refining this approach here. But from the viewpoint of the Pascal Simplicies which is a conglomeration of ipsities, i.e. non-dual between the Mass and Set approaches, the key idea is that if we consider the properties as variables as Klir does and the substance as a network of these variables, i.e. having no substance in itself, then what we have is all possible structural architectures of properties which to consider as our system embedded in an object. The Pascal Simplicies define all these possible architectures via combinatorics. The next duality is that of causality and dependence. If we are not talking about a things relation to its properties then we can think of two things in relation to each other. One kind of relation they can have with each other important in Physics is causality from one thing to another and the subsequent dependency of the later on the former. Kant assumed that causality flowed forward in time. But that this relation can leave an after image of dependence based on causality that can be seen in the moment in which some dependence is expressed based on some prior causal action of one thing on another. Our theory of Weak Measures posits that causality flows both backward and forward at the same time and it is the difference in these two flows that gives us the weak measures. Thus the fact that time direction does not matter in Quantum Mechanics has challenged the Newtonian View that Kant was trying to support. However, from the view point of Pascal Simplicies we can see that there is a spreading dissipation as new layers of the Pascal Simplicies are generated. This layer generation is a form of causality as we move from simpler heuristics to more complex ones with every layer that is added to the Simplicies. Thus even if we do not see causality and dependence in the same way these days we can see that with the complexification there is still an expanding wave of more and more complex n^n systems that gives us an arrow of time. The next dialectical unfolding of the relational category for Kant is the creation of community, which is like plurality for him, just as substance/inherence is like unity, and causality/dependence is like totality. Community is a metanomic relation between entities standing together in fields of reciprocity. This is definitely like the conjunctive relations between elements of the Pascal Simplicies that merely stand together at each stage of unfolding. Kant sees the schema related to the relations as Time Order, in other words the Pascal Simplicies acts like a cellular automata similar to those described by Wolfram except it spreads by an additive pattern. At each level a new emergent order appears. It is more than just a Time Series as we saw in relation to Quantity, but the content of Time related to Quality is ordered differently at each stage with an emergent order. The Relation Category Dialectic combines Quality and Quantity into a totalization. Quality provides the nature of the properties and Quantity provides the nature of the substance. Then Causality and Dependence allows the various substances with properties to form hierarchies in time and space. But these hierarchies are not all that exist, there are metanomies as well where things just stand together conjunctively which Kant calls community.

The final stage in our categorical journey is looking at the modalities like possible/impossible, existence, non-existence, and necessity and contingency. It is here that the kinds of Being enter the picture as they did in Aristotle surreptitiously. In Aristotle we have possibility, potentiality, actuality, necessity. These are related to the different kinds of Being. Necessity is determinate and thus Pure Being. Actuality is probabilistic and thus Process Being. Possibility is related to fuzzy math and is thus Hyper Being. Potentiality is related to propensities and thus is Wild Being. So Aristotle's causes display the different kinds of Being. If we decode Kant we can see that his three pairs of opposites attempts to get at the same sort of material. He has possibility and necessity for sure. What is actual can be seen as contingent and existent but not impossible. What is potential can be seen as non-existent and contingent but not impossible. Necessity is the opposite of the impossible in as much as what is necessary must happen in all cases. So if we parse the Kantian modalities we see an image of the Aristotelian categorization of causes, these are the same causes that appeared as dependence and causality in the last categorical set concerning relation. He connects these with the Logical quantifiers like any, existence, and all which he relates to span, moment, eternity and null which are the various scopes he identifies. Thus the categories end where the logical quantifiers begin. These scopes of time are another of Kant's schemas. Now when we start comparing this set of dialectical categories to the Pascal Simplicies we see that possible and impossible are seen in the positing by the Simplicies of all possible patterns. Other patterns of conjunction are impossible to think. Thus the Simplicies define what is possible for systems and what is impossible for systems of the form n^n. We can then count the realizations of these possibilities as Etter does to produce his Link Theory. In this way we add to the definition of possibility and impossibility the realization of actualities as existing or not existing. Not existing is to give a count of zero. But Etter would have us reserve the right to have counts that are negative or imaginary as well to account for the Quantum Mechanical case. With regard to Necessity and Contingency we see that the application of a particular n^n heuristic is a projection and therefore contingent unless that ontological projection is made necessary by the ontic phenomena on to which the projection is made in some fashion. In other words the Pascal Simplicies merely produces all possible N^n systems but the application of those systems to real things is a matter of choice unless we discover in the phenomena that some particular pattern in the Simplicies is necessary by their very nature. As far as the scope of Time is concerned the unfolding of the Pascal Simplicies inhabits all time because it is a non-dual order, that is right, which is good, which is a source of all n^n systems, and which unfolds from the root of **one**.

It is strange that the Pascal Simplicies has qualities that allow us to see it as applying to all the Kantian Categories and to the Non-duals of the Western worldview. It seems that the Pascal Simplicies is a unique Rosetta stone sort of phenomena that tells us about the non-dual basis of our worldview by giving us an object that has the characteristics of all three special systems at the same time. We would therefore expect the Pascal Triangle to also be a face of the world, i.e. a combination of all four kinds of Being at the same time as well. We saw them expressed in the relations between potential, possibility, actuality and necessity. But we can also see them expressed in the fact that the individual numbers are determinate in each unfolding layer of the Pascal Simplicies. The unfolding is the expression of Process Being. In that unfolding base elements, say groups of binary bits, are lumped together according to their inherent combinatory relations. These combinations determine possibilities and it is these possible alternatives that we dither around that cause us to enter states of Hyper Being which Derrida calls Differance. But these groups of elements in the structure of the Pascal layers gives these base systems their own inherent order. That ordering is based on the mirrorings that appear within the Pascal Simplicies as a whole. They are an expression of the propensities in the numbers themselves which has been called the Strong Law of small numbers which is that there are too few of them and thus they have over-determined use that display their propensities in the overall mathematical system. In other words numbers themselves have their own natures despite their being generated by mere repetition of addition. For instance, the structure of primes in the number system is thought to be chaotic, and this is what gives a wildness to the number system. Or we can look at the distribution of Perfect, Amicable and Sociable numbers in the natural numbers. This distribution expresses a propensity that occurs in the numbers themselves similar to the propensity that occurs in each point in the imaginary plane that gives us the Mandelbrot Set. So the Pascal Simplicies expresses all four kinds of Being as a face of the world while at the same time expressing the combined characteristics of the Special Systems. We know that the Special Systems are the distinctions between the Kinds of Being and vice versa. So the Pascal Simplicies is a single mathematical entity that brings these two sets of distinctions together in a single Rosetta stone like object from which we can read off the nature of the categories of Kant which set up the dualities and also the non-duals as well. It turns out that this rosetta stone of the Pascal Simplicies which unfolds from the Pascal Triangle also define the unfolding of the Schemas as we have seen previously because dimensional minimal Simplicies are defined by the Pascal Triangle and these in turn define dimensions which in turn define the Schemas because there are two schemas per dimension and two dimensions per schema. So the Simplices becomes the anchor for the understanding of General Schemas Theory in mathematics. But it also connects into the structure of the duals and non-duals related to the structure of the Western Worldview. So the Schemas have deep roots that grow into the subterranean infrastructure of our worldview in unexpected ways.

Pascal Simplicies and Negative Dimension

The question arises how the negative dimensionality enters into the Pascal Simplicies as it was posited to do with respect to the Pascal Triangle. We posit that the Simplicies are generalizations of the interger line by counting the discontinuities in the Pascal Line. In fact we can see the two Pascal triangles as the interference pattern generated when two pascal lines intersect. There is an hour glass of nothing in it, i.e. odd zero or void, and there is an hour glass of interference effects. This is just like we see when light passes through the two slit experiment. There are patches of spectra and patches that are blank showing interference phenomena. However, we also said that the pascal triangle and thus Simplicies mediates between surreal numbers and the normal stack of different kinds of numbers that are opposite the surreal numbers. The difference is that you cannot integrate the surreal numbers because they have holes. Also they have infinities and infinitesimals built in. Now these holes are like the holes of a sponge, and we have taken the sponge, a whole full of holes as the image of the meta-system. Thus we see on one side the normal numbers fragmented into kinds, and thus being set-like while on the other side we see the mass-like surreal numbers which can be seen just as easily as a tree of holes as a tree of positive numbers. On the side of the normal numbers there is integration and the appearance of continuity. On the other side there is discontinuity everywhere between each up and down arrow that makes up the progressive bisection of moves by which surreal numbers are specified. So we can think that perhaps when we swing around from one hour glass to the other we are really swinging around between mass-like numbers full of holes and set-like numbers which are wholly positive. This is strange because as we said the negative dimensional space is set-like while the positive dimensional space is mass-like. However, the figures on the ground of the space, i.e. the numbers in this case are reversed in nature from their grounding spaces. Thus if we think of the surreal numbers as being actually holes and that the negative numbers are a foam of holes, then our picture becomes more clear how we can take the Simplicies into the negative dimension. We can imagine that the Simplicies are surreal in the negative dimension. This actually means that instead of bits the negative Simplicies are made up of arrows. There are pairs of arrows in the negative Pascal triangle, but the Pascal tetrahedron has three arrows that are orthogonal, the Pascal pentahedron has four arrows that are orthogonal etc. This difference between the bits and the surreal arrows that represent moves will become more important as we get into n-category theory which is the next natural progression away from the Simplicies, that is away from objects to the mathematical category theory of mappings between objects. However, here in this paper we will just dwell on the Simplicies in order not to mix up different orders of concern. Understanding the Simplicies and their relation to General Schemas Theory is difficult enough at this point. In normal number theory numbers seem inherently positive. Even negative numbers have a positivistic feel to them. We tend not to think of them as holes, or voids. Our understanding takes a leap when we consider that moving into the negative dimensions means also moving to counting with holes rather than positivities. Of course, there are discontinuities between numbers both positive and negative. And we identify the even zero of emptiness as the origin of our counting procedure. But we are always counting one, i.e. always counting along the Pascal Line. Each of these one's are some interval away from our origin discontinuity. Thus the integers for us are merely a metric as to how far we are from the origin discontinuity. But when we switch over to the surreal numbers then we can see the arrows as merely indicating the differences between the holes and our whole counting regime becomes an indexing into the spaces between the holes in the progressive bisection of up and down arrows which represent moves. Note that the moves of the game are a process, which is different from the continual addition algorithm on the normal number side. Also with the surreals we get all the kinds of numbers generated from one rule, rather than having each kind of number appear as an answer to a problem. What we miss is continuity however, and we need to do non-standard analysis because we have infinitesimals built in, they are no longer an option. Cantor will be very pleased, because Infinities of Infinities are built in just as infinitesimals of infinitesimals rather than a strange add on that mirrors zero. Between these two realms of mass-like numbers full of holes and infinities and infinitesimals an the set like normal numbers stands the Pascal Simplicies. The distinction is between Simplicies built of various complex configurations of bits and Simplicies built of orthogonal arrows. The distinction is between deterministic pure Being bits that depend on Pure Being and the arrow like moves of a game that depend on Process Being. Hyper Being and Wild Being come when we try to combine these two pictures into a single picture. That is to say we have seen that the imaginary hyper-complex algebras are posited to be in the negative dimensionality as models of interpenetration. But these models are built out of nothing, which is to say that the elements of the numbers are merely surreal holes specified by moves within the whole progressive bisection structure produced by the negative Pascal Simplicies. Isn't that amazing that it is possible to think about the structure of the negative dimensions with the number theory as it stands today. Infinitesimals of non-standard analysis exists in the shadows of the negative dimensionality. The infinites of infinities of Cantor's ***alph*** exists in the negative dimensionality. What ever is banished from the normal number system which is set-like is taken in by the mass-like negative dimensionality. What ever is banished from the set-like system of numbers goes into the inverse mass-like meta-system of the surreal and hyper-complex numbers along with all the infinities and infinitesimals. There is still a lot about number theory that is not understood. But the mathematicians are not putting together the pieces they have and giving an overall meaning to those pieces. This is because they do not have systems and meta-systems theory to guide them in interpreting the differences between the various alternative types of numbers. All the odd deviant numbers have a meaning within an overall pattern that needs to be considered carefully. The special systems and meta-systems cling to these anomalies in the number system. It is always the anomalies that are the key, and close attention needs to be paid to them. Each anomalous element has its contribution to the overall pattern of the numbers in order to model the special systems and the emergent meta-system completely. Once you realize that the Pascal Simplicies are a generalization of the integers and that they are non-dual between normal set-like numbers and strange mass-like surreal numbers then it becomes clear how this non-duality leads to an image of the special systems fused into the structure of the Pascal Simplicies. It also becomes clear how we can start thinking of the negative Simplicies in terms of the characteristics of the surreal numbers as opposed to the normal numbers which include infinite/infinitesimal, transcendental, real, irrational, rational, integer, natural and zero as all separate with their own characteristics solving specific computational problems. The Simplicies can be thought in terms of multistate bit complexes or in terms of orthogonal arrows. But the arrows specify moves and they indicate holes rather than being static and indicating positivistic number essences. We get Hyper Being when we arrive at an undecidability between the negative and positive Simplicies, i.e. between mass-like and set-like qualities, or between holes and positivity, or between inter/intrapenetration and externalities. Both the positive and negative Simplicies give us the possibilities of elements at each systemic level. One represents Pure Being as static determinant elements and the other Process Being as moves in the foam of holes. Hyper Being is when we cannot chose between system and meta-system, or between positive image and negative image. Wild Being appears as the propensities in the space itself as with the Mandelbrot Set, the Quaterbrot Set, the Octonbrot Set, etc where the number systems are rotated into the imaginary realm. In that realm the individual points in space have their propensities, their escape velocity that can be indexed by a color to show us a pattern of the imaginary plane. Numbers give us images of all the kinds of Being. And the model of the Pascal positive and negative Simplicies does so even more so because it looks at the pattern of all the anomalous numbers. And right in the middle of that field we see the key role played by the Pascal Simplicies as an image of the fused Special Systems. And all this comes back to give us a ground for our construction of General Schemas Theory because the dimensionality of the Simplicies is the limit against which the emergence between schema is leveraging. In other words, because there are two schemas per dimension and two dimensions per schema the Simplicies informs our understanding of exactly how these dimensionalities unfold as the basis on which the hierarchy of the General Schemas is operating. But to get to the Schemas we have to have not just elements given to us by the Simplicies but the functions or transformational arrows that manipulate those static elements. That is to say that we need to enter Process Being from Pure Being at the meta-level. Pure Being is in a sense all the elements differentiated both in terms of system and meta-system. But now we must begin to consider how these elements intertransform via n-categories. There is a whole different type of simplical structure at the mathematical category theory level that manipulates the elements or ipsities given to us by the Pascal Simplicies. And we must consider whether that n-category theory can itself be negative and imaginary as well. In other words we must apply Etter's Link Theory program at this next higher level of the mathematical category theory.