Mathematical Foundations of General Schemas Theory

CHAPTER 3

The Foundations of General Schemas Theory

Kent D. Palmer, Ph.D.

P.O. Box 1632
Orange CA 92856 USA
714-633-9508
kent@palmer.name

Started 05.04.03; Version 0.0; 05.04.03; fgs03a04.doc

Keywords: Schemas, Systems, Engineering, Science, Meta-systems, Being, Meta-levels

Introduction

This essay[1] concerns how General Schemas Theory can be used as a basis for Systems Theory, which in turn can be used as a basis for the practice of Systems Engineering. Systems Engineering is dependent, in part, on Systems Theory for its foundations. But Systems Theory only deals with one schema, i.e., the *system,* and does not deal with other schemas such as *pattern*, *form*, *meta-system*, *domain*, etc. A general theory of schemas has not been advanced to date and so there are questions concerning the nature of the schemas and how they relate to each other. More specifically, we must explore the characteristics of what Umberto Eco refers to as the "mathematical and geometrical" type of schema in Kant and the Platypus as a general structure for the organization and comprehension of experience though the articulation of spacetime. Kant in the Critique of Pure Reason first introduced the term "schema". But since that time the concept has been used in a variety of settings with many different meanings. This essay, which focuses on highlighting a mathematical structure that explains the emergent levels of the unfolding of the various schemas, is part of a larger, and more expansive study that addresses the nature of the schema in the context of the Western Philosophical and Scientific tradition. These are the kinds of mathematical foundations that must be explored if we are to build a General Schemas Theory in which Systems Theory would be one variety of schema that Systems Engineering can use along with all the other schemas as a foundation for its practice.

[1] Presented at CSER 2004 up to Meta-Dimensionality

General Schemas Theory

General Schemas Theory is a new discipline that is meant to serve as an underpinning of Systems Theory, which in turn is seen as the foundation of Systems Engineering. Systems Engineering is a new practical discipline in search of its foundations. One good place to look for that foundation is in the well-established academic discipline of Systems Theory. Unfortunately many of those who practice Systems Engineering have never been taught any form of Systems Theory. They only know about systems based on the hearsay of our technical culture in which almost everything is called a System, so as a result, the term "system" has become next to meaningless because it is indiscriminately applied to everything. One reason for studying academic systems theory is to dispel this indiscriminate usage and to imbue the term "system" with meaning again. As we might expect, the *system schema* can only have meaning if it is compared with other schemas of different kinds. In other words, there are things other than systems in our experience and our obsession with systems schemas originates from the idea that a *schema* other than that pertaining to the *system* was central to our construction of the world. That schema

is the *form*. From the time of the Greeks through the nineteenth century this one schema was dominant in our thinking and analyzing of things around us. This is probably because we are genetically and neurologically predispositioned to efficiently focus on the *form schema* within our experience. During the twentieth century we learned to appreciate the importance of the *system schema* as different from the *form schema*. Also in this century there was an interest in the *pattern schema*, which was expressed in the Structuralist school of thought (Dosse 1997). Generally those who study systems are a different group than those who study forms or patterns. But George Klir, in his book on Architecture of Systems Problem Solving, brought all three of these schemas together and constructed a new way of thinking about systems in relation to those other schemas to produce an Advanced General Systems Theory. It is this version of General Systems Theory from which I wish to take my departure in the construction of General Schemas Theory. George Klir contributes the key concept combining the best aspects of these three different schemas to support a deeper understanding of phenomena. However, we do not have to stop at the consideration of just these three schemas, we can go on to consider all possible schemas and their interaction as a means of supporting our Systems Engineering practice by extending the academic study of other sorts of schemas not normally talked about, even by academic theorists. What is strange is that schemas are developed in specialist disciplines because they are needed to study the phenomena in question, whatever that may be. It is unusual for the schema to transcend the discipline in the way that the system schema has through the establishment of General Systems Theory. General Systems Theory looks across all disciplines and identifies how the systems schema contributes to the understanding of phenomena in each discipline and attempts to produce generalizations about the system that cuts across all disciplines and all uses of the system's schema. This is the only schema for which there is a meta-discipline of this sort. Almost all other schemas are bound within their disciplines and their various uses which are isolated by: differences of terminology, differences of method, and differences of approach that apply to these schemas in each case. It is only a few farsighted theorists like George Klir who have begun to consider multi-schema configurations across disciplines, which he still calls Advanced General Systems Theory because the focus is still the *systems schema*. He considers the two lower level schemas of *pattern* and *form* that exist below the systems schema and demonstrates how they support and further explicate systems analysis and synthesis with regard to understanding phenomena. We want to break out of the attachment to the systems schema and treat each schema in its own right and understand its interaction with other schemas in a way that allows any one schema to take center stage and consider the supporting role of other schemas to it. Any schema can be the figure on the ground of all the other schemas. *This is the sort of analysis that only a new discipline of General Schemas Theory can carry out without prejudice to one schema over another.* The point is that Systems Engineering practice calls upon us to take this step because it needs the cooperation of many schemas simultaneously to perform its work effectively and efficiently. The three schemas that Klir studies are a good start, but they are not enough to support the full range of tasks demanded by Systems Engineering practice. So it is incumbent on us to study the interaction and interrelations of schemas of various sorts and *thus extend General Systems Theory into General Schemas Theory*. This is in response to the urgent needs expressed by Systems Engineering, which is attempting to build more and more complex systems all the time. This increasing complexity is exceeding the bounds of what the systems schema can support. Now we hear talk of *Systems of Systems* as the proximate extension of systems engineering. What is *not* realized is that *the next schema up from the systems schema is not a doubling of the system but something emergent*, something different that we have little expectation of in our attempt to talk of nested systems of *systems of systems*. The next

level up from the *systems schema* is actually the *meta-system schema*. But this is just one of a whole series of emergent levels in the unfolding of the various schematic levels above the *system*, but also below the *pattern*. Although we would like to focus on the relation of meta-systems to systems and the emergent properties of the meta-system over the system, it is necessary to do that in the context of a general schemas theory which explores *all* the schemas, rather than merely concentrating on a few.

If we wish to construct a fully-fledged General Schemas Theory then the first challenge is to identify all the schemas that exist and to understand their relations to each other. This is a hard problem because schemas for the most part are developed in specialized disciplines to solve particular problems and even if the same schema is developed in different disciplines there is little cross pollination between the various formulations of the same schema in different disciplines. In other words we are attempting to do for all schemas what General Systems Theory has done for the system schema, that is look across all uses of any one schema across all disciplines and attempt to generalize about each schema's usefulness in these many different contexts. We can see how long it has taken to do this for the systems schema, a job that is not near completion. So how are we expected to do the same thing for all schemas within a brief compass of our research? The answer of course is to develop a hypothesis, i.e. using what Charles Sanders Peirce called "abduction." In other words as I read and studied many different disciplines, I began informally keeping track of when a new schema was being described. I have collected these observations and produced a hypothesis as to the extent of the proliferation of different schemas in various disciplines. Once this list has been compiled and understood then we can begin to look for schemas that do not appear in the list, and we can also look to see how the same schema appears in various contexts, as well as how different scholars attempt to compare the various schemas. So here is my hypothesis for the hierarchy of schemas:

- Pluriverse
- Kosmos
- World
- Domain
- Meta-system
- System
- Form
- Pattern
- Monad
- Facet

When we look at this hierarchical list we see that each schema in the list is unique in its properties and characteristics, it is an *emergent hierarchy*, which I call the *ontological hierarchy,* as opposed to the *ontic hierarchy* of emergent levels of things. We discover the emergent hierarchy of things through applying reductionism in science. Emergent levels of phenomena that we do not succeed in reducing we recognize as supervenient. However, the way we understand phenomena is by projecting generalized schemas onto it, which, in turn, breaks up our experience of spacetime. The number of generalized schemas is limited. Everything that emerges as phenomena must take one of these schematic articulations. This is prior to our categorization of them. This is at the point where we first recognize the phenomena as residing within spacetime. In other words, a phenomenon first must articulate spacetime prior to its categorization as to a specific type of phenomenon, and prior to its individualization as a specific individual with its own unique characteristics, and also prior to having a meaning assigned to it. Here, we are specifically talking about a 'so called' mathematical or geometrical schematization, which is identified by Umberto Eco in Kant and the Platypus as different from other uses of the term schema. The *locus classicus* of this concept is Plato's Timaeus where he talks about the two types of triangles that produce the Platonic solids related to the elements. Here geometrical forms are used to describe minimal articulations of spacetime as a way of producing envelopes in which the qualities of

"Platonic forms" might manifest (Silverman 2002). Here we will not go deeply into the genealogy of the concept of the schema. But we merely want to note that it shows up very early in the Western Tradition, and appears prominently in Plato, Kant, and Heidegger's interpretation of Kant. In Plato there are two types of "forms" inside and outside spacetime. The forms inside spacetime, that are articulations of the "receptacle," are produced from geometrical schemas. In Aristotle these two extremes are conflated into a theory of how "spacetime bound" substances have essences that are immanent to them. Aristotle develops his theory of categories to define all the ways you can talk about these things. Kant takes up and modifies the category theory in his own way but ties it to spacetime through the concept of the schema. Heidegger (1962a) points out how the Transcendental Imagination was an independent faculty in Kant's first critique, but it was subsequently relegated to a lesser position in the hierarchy of the faculties. Heidegger uses this change in the hierarchal status of the Transcendental Imagination as the basis for showing how Kant had come close to his idea of *dasein.* But we note that it is from the Transcendental Imagination that schemas arise as projections of partitions on the plenum of spacetime. So it appears that the schema plays a fundamental role in the transformation from Kant and Husserl's transcendental idealism, which is based solely on Pure Being, to the Heideggarian concept, which differentiates between Pure Being and Process Being. This difference shows up as the difference between the various modes of being-in-the-world, i.e. present-at-hand and ready-to-hand. This inaugurates the postmodern era in which different kinds of Being are identified. Ultimately four different types of Being are discovered in the work of Heidegger, Merleau-Ponty, Derrida and others. The impact of the fragmentation of Being profoundly revolutionized modern continental philosophy, in spite of the lag in recognition by Analytic strains of philosophy which still cling to the dream that all philosophy can be done within Pure Being. Instead of following out this genealogy of the concept of the schema and how it plays a crucial role in the revolution in our understanding of Being in the last century, we will merely note that schemas have a long and important role within the Western philosophical tradition and, for now, we will confine ourselves to defining the schemas that we are interested in as geometrical or mathematical following the usage of Umberto Eco who clearly distinguishes these kinds of schemas from other later uses of the word in the Western Tradition after Kant. The word is used in a bewildering variety of ways and this should not confuse us if we stick to the use of the concept as propounded by Plato and then Kant. However, because the meanings of these philosophers' systems of thought have various interpretations, this way of defining the schema has limited usefulness.

Let us return to the list of schemas that have been proposed above, and to the distinction between this ontological emergent hierarchy and the ontic hierarchy which might include gaia, social, organisms, organs, cells, molecules, atoms, particles, quarks, strings. Any of these ontological schemas can be applied to any of the ontic hierarchy thresholds. There is a multi-schema projection on any one ontic emergent threshold of phenomena and this has become a source of endless confusion in science. One scientist will be talking of a cell as a form, while another will be talking about it as a system, or another will be talking about it as a meta-system. They will end up talking past each other because the projected template of understanding is different in each case. However, in each case there is a projection of Being onto the ontic particular in a specific template of understanding. *Dasein* is composed of various existentialia such as Talk (*rede*), Discoveredness (*befindlichkeit*), and Understanding (*verstehen*) (Heidegger 1962b). The words that we use when we talk about schemas are projected by our understanding on phenomena. By this process we discover not just the phenomena as pregiven, but ourselves as pregiven. Talk must always be about something and it generally involves the application of the template of understanding to

some level of the ontic hierarchy of phenomena. Talk ultimately evolves into Theorizing. Discoveredness is the pregiven preontological horizon of our experience that we explicate with our theory. Understanding is based first and foremost on the projection of schemas, which delimit phenomena in spacetime so that they can be categorized and then recognized as individuals. *The odd thing about us is that we locate ourselves in spacetime, theorize about ourselves and project the same templates of understanding from the ontological hierarchy on ourselves as we do any other phenomena.*

We have taken the normally emphasized schemas of system, form, and pattern and added several others both above and below them each having its own emergent characteristics. Guessing what these other macro and micro schemas might be is the trick here, and that guess comes from a broad reading of the Scientific and Philosophical literature. We want schemas that would be generally recognized by multiple disciplines as significant. But we also want to stretch the limits and go slightly beyond what is merely universally acceptable in a way that is consistent with the rational expansion of the series. Thus, it is clear that the next thing down from a pattern must be a *monad*, but we also know of monads that are faceted like quarks in particles and so we can consider that the lowest schema in our series might be the *facet*. Basically the monad is the smallest unified object. But it always seems that there is some patterning below whatever level we project as the lowest, so the facet allows us to explore this patterning even if we cannot distinguish the component as a separable object. In the other direction we run into a different problem which is that we have no single concept for the schema that is the next highest in the hierarchy from the system. Thus this has been called the meta-system. It is seen as the inverse of the system, and thus can be described as an environment, context, situation, milieu, or in other terms that are similar. The lack of a specific word for this ontological threshold is a source for much confusion. However above that level there are again general words that cover the higher-level ontological schemas, i.e. domain, world, kosmos, and pluriverse. With the pluriverse we are again pushing the envelope by admitting the hypothesis of the Many Worlds from physics, which posits that our cosmos is not the only one to exist (Deutsch 1997). This is the simplest hypothesis that comes out of quantum mechanics, which might explain its eccentricities. Yet, domain, world, and kosmos are fairly standard terms that can be understood by almost everyone. Domain means a discipline, as, for example, a department in the university. A world, as described by Heidegger, is the all-encompassing human lifeworld within which we live our lives. This is distinct from the Kosmos which is a schema projected beyond everyday experience which we use in order to attempt to comprehend the physical universe in which our world is embedded. Quantum mechanics offers subtle glimmers that our kosmos may not be the only one, so it is good to define that level of abstraction just in case. The intention of positing the ontological hierarchy of the schemas, is to produce a set of "nested templates of understanding" that will allow us to comprehend phenomena that we discover as "onticly given" at various emergent levels. This particular series of schemas is as good a place to start as any in our search for a complete set. Each of these has been developed in at least one discipline. They seem about the right distance apart in terms of the spacing of their emergent levels. They are each significantly different from each other in terms of their organization and characterization. If we could understand how this set of schemas might work together then we would be in a much better position to understand the relationship of the system to the meta-system. However, it is imperative to first understand how the whole set of schemas works together and this will provide a basis for understanding the system and meta-systems and then the special systems.

Now, in the process of advancing a theory of schematization we will search for a way to generate the hierarchy of the schemas that will bring out their mathematical or geometrical

nature rather than connecting them to any particular discipline. Plato posits the 'receptacle', which is undifferentiated spacetime. He then posits that this plenum must be broken up and he gives this job to his Demiurge. The Demiurge creates two types of triangles and those are used to build the platonic solids, which are then seen as convex polytopes in which "Platonic Form" qualities, like earth, air, fire and water, may enter and exit spacetime. In other words there is a marrying of quantity and quality at the micro level of phenomena giving rise to things that might be seen as particulars with organized essences rather than merely bundles of properties. What we want to do is to find a mathematization that is not only similar to this, but also more general and universal. When we survey mathematics for such a "generating mathematical object," what appears to be most appealing is Pascal's triangle. Pascal's triangle is a pyramid of numbers produced by adding the digits in the previous line to get the digits of the current line. It produces an infinite triangular pattern of numbers, which turns out to be central to the development of mathematics.

```
          0                          -2d
          1                          -1d
        1 0 1            point       0d
      1   2   1          line        1d
    1 3   3   1      triangle        2d
  1 4   6    4  1   tetrahedron     3d
1 5 10  10   5  1 pentahedron      4d
```

For our purposes, the most significant aspect of Pascal's triangle is that it generates an image of the minimal solid for each dimensional space. This has been well known for a long time and is used by mathematicians for many purposes. What I have discovered is that each Schema has images at two different dimensional thresholds in space. So, for instance, the *form* has both two and three-dimensional images and the *pattern* has both a two and a one dimensional image. *I hypothesize that the hierarchy of ontological schemas corresponds with the dimensional unfolding of the Pascal triangle in such a way that each schema has two images on adjacent dimensional thresholds.* In this way the schemas interlock with each other. One image is a positive image and the other is negative. The negative image of one schema fits into the positive image of the other schema at the same level and thus these schema images interlock with each other like Russian dolls.

```
          0          -2d void null
          1          -1d null facet
        1 0 1         0d facet monad
      1   2   1       1d monad pattern
    1 3   3   1       2d pattern form
  1 4   6    4  1     3d form system
1 5 10  10   5  1 4d system meta-sys
```

The Pascal Triangle is a way to project partition on the spacetime plenum though the unfolding of dimensionality. It simply unfolds by addition starting with one and then dividing one by one to create the space within which the dimensional unfolding occurs. By defining the minimal solid for each dimension we then create the interlocking of the dimensions since the minimal solid has one less dimension than the space in which it appears. Ours is a four dimensional ambience but objects in this ambience are three-dimensional. The production of the minimal solids embodies the object within the dimension. Out of the possibility of simpler solids unfolds more complex solids. More complex solids are necessary to fill all of space. There are eight solids that are all space filling and thus defining the whole space. Now in each dimension we can use Euler's laws to define the number of platonic solids in that dimension. In the case of the third dimension there are five, in the case of the fourth dimension there are six, in all other dimensions there are three platonic solids. Knowing the

minimal solid in each case allows for the other solids to be deduced. These allow the all space filling solids to be deduced as well as the Archimedean solids. Now, because of the three dimensional nature of solid objects in our four-dimensional ambience, we normally do not explore higher geometries which we can define algebraically because we are not able to represent them without distortions. But this does not mean that we don't project higher dimensions regardless of the limits of the space we are trapped within. Thus I propose that the series of schemas continues to unfold according to the same pattern up to at least the pluriverse. I propose that the schemas always have images on two-dimensional thresholds and that this defines how they interlock with each other.

```
          -1              -3d source

           0              -2d void null

           1              -1d null facet

          10 …          0d facet monad(origin)

         1  2 …            1d monad pattern

        1 3   3 …          2d pattern form

       1 4  6  …           3d form system

      1 5 10  10  …        4d system meta-sys

     1 6 15 20   …         5d meta-sys domain

    1 7 21 35  35  …       6d domain world

   1 8 28 56  70  …        7d world kosmos

  1 9 36 84 126 126 …    8d kosmos pluriverse

1 10 45 120 230   …    9d pluriverse unknown
```

- Pluriverse Schema – superstructure past all determinate discrimination.
- Kosmos Schema – largest discriminable item.
- World Schema – largest set of human projected coherences of perspectives.
- Domain Schema – sets of disciplined and coherent perspectives.
- Meta-system Schema – environments encompassed by horizons.
- System Schema – objects and their relations seen as gestalts.
- Form Schema – shapes of objects.
- Pattern Schema – mixtures of discriminable elements to produce ordered variety.
- Monad Schema – smallest discriminable item.
- Facet Schema – substructure past all determinate discrimination.

One of the key things that Heidegger says about *dasein* is that it's Being overflows as an ecstasy. Part of this ecstasy could be seen as the projection of higher dimensional organizations onto phenomena. The Pascal triangle is a simple model of how this can be not only an additive process but also one that grows exponentially at each level as 2^N elements. But this projection of templates of understanding is more than just a dimensional projection because each schema has its own characteristics that are emergent in relation to the last threshold. The templates of understanding are constrained by this dimensional unfolding which partitions spacetime, yet, because of the emergent qualities of each level; the organization of each schema is different from those before or after it. Each schema spans two dimensions and connects them just as the dimensions connect two schemas each. Thus the schemas are the complementary opposite of the dimensionality, not the dimensional articulation of spacetime itself. Dimensionality and the Templates of Understanding represented by the schemas serve as mutual limits. Things understood must be understood within the framework of dimensionality. They are mutually limiting. One partitions spacetime in order to have an envelope that encompasses that which is to be understood. The other gives a transformational infrastructure between dimensions. Form appears as two and three-dimensional. Dimensions are connected by schemas and schemas connect dimensions. The two together give the intellect something to categorize, something to individuate and something to assign meaning to. Plato studied the Form. He thought that form had two *dimensional embodiments* that were the substrate for the expression of qualities. But today we know that form is not the only schema, and thus we must use Pascal's triangle to express the dimensional articulation of these other schemas that overflow our physical spacetime ambience with dimensional representations

that go beyond our three dimensional objects in a four dimensional ambience. What we understand best are those schemas that are the same or less than the limit of objects in our ambience. However, we use the other dimensions to comprehend the complexity of interrelations between things in our ambience. These dimensions create the openness, which Heidegger called the *clearing-in-being* which, in turn, allows for different sorts of *closure* by which we reify our experience into a series of meta-stable configurations that Hilary Lawson calls "material". For those closures of the openness we need the schematic templates of the meta-system, domain, world, kosmos and pluriverse, which have higher dimensional embodiments. But because their dimensionality exceeds that of our capacity for consciousness of spacetime, we have a much harder time defining these macro schemas to our satisfaction. They are an essential way in which our understanding overflows our embodiment, just as our talk overflows our comprehension, or our discoveredness overflows our ability to define and delineate everything we know leading to what Michael Polanyi calls *tacit*, or implicit, knowledge.

There is a lot more to say about the relations of the schemas to each other. For instance, each schema is produced by the conjunction of the two adjacent schemas so that they form an autopoietic ring, which, like the Ourobouros, eats its own tail. But our mission here is to merely present the key idea that differentiates the schemas from each other which is the unfolding of the Pascal Triangle where each schema comprehends two dimensions and thus is allowed to nest with its adjacent schemas. This shows that there are discrete bounds on the unfolding of the schemas tied to a crucial structure in mathematics. Each schema is therefore a series of transformations between its two dimensional images. Lower dimensional images serve as representations for higher dimensional images. Thus a two dimensional outline seen as a form is a representation of the three dimensional shape of a similar form. Representation then gets passed down through the hierarchy. A two dimensional outline can be seen as a two dimensional pattern which then can be transformed into a one dimensional patterning on, for example, a TV screen or a computer screen. This passing down of representational images to lower dimensions is the basis of the technology underlying the preservation and transformation of representations in our culture[2].

This realization of the relation between the Pascal Triangle and the Schemas is one of the fundamental results of my research. It actually provides the beginning of a mathematical foundation for General Schemas Theory because it relates the schemas directly to certain dimensions in an interesting way. We will build on this relation in the rest of this essay and attempt to explore its implications. But there is little doubt that this thesis more or less stands or falls by the substantiation of this claim. N-dimensional space is a very precise and discrete structure and the fact that schemas are the duals of this space gives lots of leverage on the structure of the schemas as a whole providing it with a backbone that would not exist if this relation did not exist. But once we realize that such a relationship between n-dimensional space and the schemas do exist this gives us a wedge to open up the mathematical relations between schemas and other mathematical aspects categories. The rest of this essay will speculatively explore some of the territory that is opened up by this hypothesis of the relation between the schemas and dimensionality.

Meta-dimensionality

It is interesting that we have a concept of dimensionality from zero dimensions up to n-dimensions, i.e. infinite positive dimensions. We do not have a theory of negative dimensions nor do we have a theory of meta^n-dimensions. One of the things that the theory of the relations between schemas and dimensions opens up is the question of the relation between finitude and infinitude. There are only ten major schemas that we know of

[2] End of CSER 2004 paper

right now. But there are infinite dimensions. When we map the schemas onto the dimensions we only use up thirteen dimensions three of which is negative. This is of course a very non-intuitive result as most people would say that negative dimensionality has no meaning. So two questions arise from this mapping. One is about why negative dimensions are used, and the other is why only certain finite dimensions are used out of the infinite number, in other words why are there not infinite schemas. The question about why there are not infinite schemas is fairly easy to answer because we are finite creatures. We could not handle infinite schemas if they existed. So there must be some function that allows us to cut off our exploration of higher dimensions at some point. Schemas do that at the ninth dimension. It is interesting that schemas theory confirms the latest string theory that proposes that there are eleven dimensions to our universe. We need just eleven dimensions to cover all the schemas. This gives us a hypothesis that rather than the other dimensions being rolled up very small or on the other hand expanded out very large, that the other dimensions beyond the four we normally experience as spacetime are actually the positive dimensions of the universe and the others are like an iceberg pushed down into the negative dimensions. However for this speculation to have meaning we would have to show that negative dimensions have meaning. So that brings us again to our other question which is how it could be that the schemas touch the negative dimensions. How can it be that facets have negative dimension one as well as zero dimension. This is a very difficult question and not one for which I have a ready answer at the moment. However, rather that tackling this very difficult problem here at this point, as I did in my working papers, we will rather first try to talk about a more promising avenue of exploration that is also an implication of the relation between the schemas and the dimensions. That is the question of multi^{n}-dimensionality.

Multi^{n}-dimensionality is different from multi-dimensionality. Multi-dimensionality suggests that something merely has many higher dimensions. Multi^{n}-dimensionality suggests that there may be other types of dimensionality than the ones we normally consider. Why is it that we have not developed a series of things like dimensions each of which were of a different kind but each of which stretch off into infinity. N-dimensionality would be meta^{0}-dimensionality in this series. So the question becomes what are the meta^{n}-dimensional strata beyond dimensionality and the corollary of that question is whether meta^{n}-dimensionality can be negative. This also is a difficult set of questions but it might make it easier to believe that there was negative dimensionality if there were negative meta^{n}-dimensionality. The reason that schemas and their relation to dimensionality raise this issue is that schemas are finite and dimensions are infinite, so we would expect that if there were meta^{n}-dimensional regions that they would also have their own finititudes associated with them from our human point of view. In other words the question is whether shemas as finitely limiting structures on an infinite field is a unique structure or a general structure. In mathematics we look for general structures. Schemas are not mathematical per se but appear in this new region between logic and math related to spacetime embodiment which has to be finite. So if we can show that schemas are a general structure of embodiment then we are likely to open up a whole new horizon of research into the finitudes associated with the various infinite meta^{n}-dimensional fields.

The path of thought that we are following here is already mapped out in the working papers associated with this thesis. We attempt to rehearse it again here in a more organized manner that it appeared with its first discovery to provide a meta-hodos, a way after for others to follow this reasoning. Essentially, what I did was connect the fact that there were meta-levels of Being at augmented each of the schemas, which we have already addressed. That to me said that there were meta^{1}-dimensional structures called the standings of which Being and Existence were at least two

types. It is also clear that the Aspects of Being, i.e. truth, reality, identity and presence were orthogonal to the Standings and so that they were a good candidate for the meta^2-dimensional finitudes. At this point I had to stop and think about the implications of this opening up of positive meta^n-dimensions. In effect, we were saying that in Ontology we were exploring the meta^n-dimensions all along. That Schemas, Standings and Aspects were internally related to each other as an elaboration of the lower level meta^n-dimension in the next higher meta^n-dimension. And the meta^n-dimensions were in fact structuring our experience of our worldview from an ontological perspective. This was a very big speculative leap. But putting all hesitation aside I was willing to make that leap because it suddenly unified ontology and schemas theory intrinsically. What I did next was somewhat intuitive and unconventional. I reasoned that I knew of seven standings and I knew there were ten schemas and four aspects, so I assumed that there was a falling off as we moved up the meta^n-dimensions into the core of the worldview. So I assumed that this falling off was of the order of 3, 2, 1 and looked up the mathematical series that resulted in the encyclopedia of mathematical series on the internet. To my surprise there was one series that was interesting that had that structure and that series was the fibered rational knots which has a series of the following form: 0, 1, 1, 1, 2, 3, 4, 7, 10, 16, 40, 62, . . . So I began studying fibered rational knots and wondering why this subset of all knots would be the basis for the finite articulation of the meta^n-dimensions. This is a big question to which I still do not have a very good answer. But slowly various pieces of the puzzle are starting to fall into place. The real question was why knots at all. I was pondering this question when I went to the 2004 ISSS.org conference where I heard Robert Rosen's daughter giving a eulogy of her fathers work. During her presentation she had many slides of Celtic Knot patterns. As I watched that slide show of knot patterns I realized that knots were the basis for self-organization. It is knots that give us the fundamental atomic patterns of self organization because they are the self-interaction that produces an organization in material strings. The reason that the finitudes that are related to the various meta^n-dimensions are expressed in knots is that they represent the atomic structure of self-organization. The reason that it is fibered knots is that it is these knots that are totally embedded in their context. The reason that it is rational knots is that it is these knots that can be produced with an algebra like process. And the reason that it is a subset of all knots is that there are some self-organizing patterns that fall outside the contextually dependent but rational knots. The worldview does not represent all possible self-organized patterns. There is more in this world than is represented by your philosophy, Horatio. There are more ways to be self-organized than the contextually embedded but rational ways. So I began to try to work out the meanings of the higher meta^n-dimensions. For instance, I knew that the worldview was organized into three regions comprised of two duals and one nondual on the model of the three possible algebras (xy=0, yx=xy, yx=-xy). So I assumed that these regions comprised meta^3-dimensionality. And it is clear that the worldview is dualistic so the I assumed that this dualistic basis was the expression of meta^4-dimensionality. Finally there was the three ones of meta$^{5\text{-}7}$-dimensionality that corresponds rather nicely to the trinity, which is actually an old Indo-European theme that we see in Odin being High, Higher, Highest, and not just a Christian theme. Trinities also appear in the Hindu branch of the Indo-European tradition. So I could explain each of the higher meta-dimensions and found it was interesting that they only went as high as the seventh meta^n-dimension and no further into the infinite possible meta^n-dimensional series. But to me the most interesting thing was the fact that the series of fibered rational knots itself continued infinitey into the negative meta^n-dimensions where it only had finite height in the positive meta^n-dimensions. This was some corroboration that negative dimensions were important if negative meta^n-dimensions were important. And it also alerted me that there

may be structures at a lower level than the schemas in these negative meta^n-dimensions that were as important as the schemas. What I liked about this structure of finitudes that stand against the infinitudes of the various meta^n-dimensions was that it gave me a unified theory that was mathematically based concerning the context of the schemas theory. It provided a genuinely mathematical hypothesis about the foundations of General Schemas Theory that gave us some possible insight into the structure of the Western Worldview itself, which explained why various philosophers had raised the issue within the tradition. However, it must be admitted that the idea of the finitudes that stand against the meta^n-dimensional infinitudes is a extremely wild idea. What are the chances that such a higher level mathematical grounding for schemas theory like this could exist. And if it did exist what are the chances that we would find it so quickly and in the realm of knot theory. What we can say for sure is that schemas are orthogonally elaborated by meta-levels of Being and that meta-levels of Being are articulated by aspects of Being, and the worldview definitely has both a threefold and two fold core structure as well as a Trinitarian bias. So whether we completely accept the series of the fibered rational knots as an underlying organizational structure for the worldview we can accept fairly easily the fundamental levels of articulation of the worldview. What we need to do is to take the series of the fibered rational knots as a speculative hypothesis and to see what it tells us that we would not already know, and see whether any of those auxiliary characteristics can lead to a deeper understanding of the structure of the worldview and the place of the schemas in that worldview.

On place where this speculative hypothesis pays off handsomely is when we use it to project what might be beyond the schemas at the level of the negative meta^n-dimension. There the series of the fibered rational knots projects that there would be some organizing principle beyond the schemas which we will call the Arche. It is called the Arche because it corresponds with the Quadrate of Quadrates proposed by Jung in his work Aion. The quadrate of quadrates is a structure of a minimal system of minimal systems to use Buckminster Fuller's term from Synergetics. Jung posited this as the fundamental archetypal structure. It is made up of sixteen archetypal elements that are embedded in the collective unconscious as discovered by the Alchemists. The fact that it appears in negative meta^n-dimensionality fits well with it being a collective unconscious structure. We would expect that the schemas were not the first such structure shaping human experience. We know from many studies that that much of what we experience is based on unconscious structures that we are little aware of consciously. We would expect self-organization to be occurring prior to consciousness that occurs with the appearance of things in spacetime. In fact, the finitudes of the fibered rational knot series suggests that most of the self-organization that occurs appears in the negative meta^n-dimensions and only a limited amount of organization appears in the positive meta^n-dimensions. This corresponds well with what we know from studies of consciousness where it is clear that the amount of data processed consciously is only a small part of the data processed within our bodyminds. However, these hints that the structure of the fibered rational knots may be right do not prove that this particular structure is significant and not a fluke. It is hard to imagine what might prove that this particular structure has organizing significance within the worldview in general and designates the finitude of the schemas specifically. Rather we must merely take it as an operating hypothesis and attempt to see how much we can glean from the use of this unusual hypothesis that might make the relation between finitude and infinitude comprehensible. As far as I know in Mathematics there are only finite or infinite structures and there is no criteria for adjudicating between the finite and infinite. However, in the realm of schemas I would argue that there is a pressing need for such adjudication, because the schemas must function as a measure of phenomena against

the perception and cognition of man which is a finite being. Humans cannot stand too much reality, especially if that reality is infinite. So intrinsic to the nature of schemas, I would argue, must be some function which causes some set of finite resources to be picked out of the ideally infinite possible resources. These resources are in the case of schemas ways of organizing phenomena through templates of understanding. We would expect these templates to self-organize and to be different from each other as the separate knot patterns would suggest. The knots represent atomic interference patterns at a certain level of complexity. In this case the knots have ten crossings. These are the fibered rational knots out of all knots at this level of complexity which are one hundred and sixty five possible self-organizing patterns. So if we use this analogy of knots then we can say that the schemas are only ten of one hundred and sixty-five possible self-organizing templates of understanding. They are the ones that are fibered, i.e. embedded in their context and which are produced rationally, i.e. by algebra like operations. The others are either not contextually embedded or not rationally produced. The contextual embedding we can see as important for embodiment. We are dealing only with patterns that are deeply situated, but also at the same time rationally comprehensible. We can see clearly that rational comprehension is important to templates of understanding, while the contextual embeddedness is important to embodiment. But it is also important that the schemas are not the only such patterns, there are other ways of self-organizing at this level of comprehension that are not schematic. In other words the schemas are a select or small set of ways of understanding intelligible embodiment out of many other ways which are also finite in relation to the infinitude of dimensions. When we say that things have a mind of their own, or that they have a life of their own, they may be operating out of one of these other atomic self-organization patterns, and still be within a finite realm against the infinitude of dimensionalities. Thus there may be embodiments that are not intelligible to us because they are not rational, or because they are not situated completely. Nomos gives us an infinite number of dimensions, but within those only one hundred sixty five proto-schemas can exist out of which there are only ten schemas. Notice a very important point, which is that the number of schemas and the number of crossings of the fibered rational knots are the same. There is an isomorphism between the number of self-interferences and the number of different schemas we have available to us. This suggests that the schemas themselves can be seen as a set of self-interfering patterns which means that they take their form from their diacritical relation to the other schemas which is then given meaning when compared to the hundred and sixty-five possible self-organization patterns at this level of knotting.

But all this raises the question as to why knots should be the cross over point between finitude and infinitude. Knots are one dimensional lines in a three dimensional space that form a closed circuit with self-interfering crossings that alternate. There are in fact two dimensional knots in four dimensional space, three dimensional knots in five dimensional space, and so on infinitely. Why should it be that the finitude of the schemas are determined by the one dimensional knots in three dimensional space and not some other higher level knotting formation? There is no good answer for this question except that one dimensional knots are the simplest possible knotting patterns of self-organization, and the higher level knots might have some other unknown meaning that we will discover some day. In effect this finding with regard to the role of the fibered rational knots in determining the articulation of the finitude within our worldview is a fluke. It is very suggestive but difficult to see how it might be proved to be significant. All that can really be said is that if this concept of the role of the fibered rational knots of determining finitude in the face of infinitude with respect to the meta^{n}-dimensions is not correct, then there must be something else that motivates the production of this criteria of finitude in relation to infinitude and that won't come from

mathematics itself. In fact, it must be the hallmark of the schemas to specify this criteria. And knots seem to be the right sort of mathematical object to do this work because they represent atomic differences of self-organization which are finite at any given level of complexity. What we see here is a juxtaposition of an infinite series of knots with an infinite series of dimensions where there is a specific correlation between certain levels of knotting with certain meta^n-dimensionality. It is the juxtaposition that gives us the finitude, within the realm of positive meta^n-dimensionality. These finitudes determine the inner structure of the Indo-European worldview which we have inherited. We do not push the comparison past this particular worldview within which we find ourselves globally embroiled in which schemas play an important role. Perhaps other worldviews have different structures of self-organization within the various meta^n-dimensions.

But what we can say is that if, and this is a big if, it is the fact that the finitude of schemas are related to the fibered rational knots as a series within all possible knots juxtaposed with the meta^n-dimensions as we have suggested, then this gives us a basis for understanding much more about the worldview than the schemas. And we will proceed speculatively on this track until we encounter obstacles that would make us reconsider this hypothesis. By having a specific mechanism for producing the finitude in the schemas that reaches beyond the schemas and which confronts the infinitude by limiting it to the human scale we have a more specific research program that is suggested, than if we merely gave up this hypothesis because we cannot prove it. Better to proceed abductively in this case and see how much sense we can make out of the worldview on this basis. What it tells us is that there is a general mechanism for limiting infinitude to finitude based on the possibility of self-organization. Knots give us an atomic table of self-organization at each level of complexity of self-interference. Within knots there are different kinds of knots and in this case the fibered rational knots play a special role in delimiting the schemas and other meta^n-dimensional structures within the worldview. Delimitation of infinity by self-organized structures is a more general mechanism than just the delimitation of the schemas as against the infinitude of dimensions. This in itself could be an important finding. And what is interesting is that the set of finitudes that we see at the various meta^n-dimensions are those we have already discovered separately, but that this structure of meta^n-dimensional extension allows us to understand how these various finitudes relate to each other.

So by extrapolation we can say that there are sixteen Arche which are extended by the ten schemas which are in turn extended by the seven standings and which in turn are extended by the four aspects, that are extended by the three regions, which are in turn extended by the two duals, which are in succession extended by the three ones up to the seventh meta^n-dimension. Since there is no finitudes beyond the seventh meta^n-dimension we can say that it is impossible for us to experience anything of those higher meta^n-dimensions so in that we have reached the ultimate extent of the worldview. This structure unifies our ontology and teaches us some important lessons with regard to the schemas and the other finitudes. Of course, each meta^n-dimension is infinite. So these finitudes produce an envelope of self-organization within the wider envelope produced by all possible knots. But both envelopes limit our access to the infinitudes at each level of meta^n-dimensionality. In this way embodiment within the worldview is limited at each level which accords with our finitude as Dasein.

We have spoken about how it is the ecstasy of Dasein that projects the higher dimensions associated with the higher order schemas. But little did we image that orthogonal to that dimensional expansion there is a meta^n-dimensional expansion as well, which is equally limited as we go up the levels of meta^n-dimensions. This gives a whole new meaning to the finitude of Dasein, i.e. being-in-the-world. And it also gives us an order that

is very specific within which that expansion takes place. First there are the Arche, we won't speak of the lower levels of self-organization in the negative meta^{n}-dimensions. The Arche is the only one of these formations that we know have been recognized by a scholar in our tradition, i.e. Jung in his alchemical writings. The Arche sets up the minimal system of minimal systems in B. Fuller's terms which is the prototype for the thing as minimal integrity. Those sixteen possible minimal integrities can be expressed in any of the schemas which are ten and are based on the scale of the thing as expressed within these templates of understanding that express minimal embodiments associated with dimensions. The schemas each can be articulated at seven possible standings the first four of which are the kinds of Being including Pure, Process, Hyper and Wild Being. When we reach the fifth meta-level of Being there is a phase transition into Existence which can include Ultra Being, Emptiness or Void. Then there is a phase transition into manifestation and then into non-manifestation. All of the standings can be articulated in terms of the four aspects of Being: truth, reality, identity, and presence. All of the aspects of Being can be articulated in the three regions of Being which include the duals and the nondual. The three regions each have two duals related to them. And each dual can be extended into the trinity of the three ones at higher and higher meta^{n}-dimensions that take us up to the seventh meta^{n}-dimension. This is the structure of our Western worldview based on Indo-European models that stretch back into the mists of time. Why the Western worldview has this structure is unknown. But there are many confirmations of this structure when we read the worldview in an ontomythological manner. What is unique about this way of putting it in terms of meta^{n}-dimensions is that it allows us to see the connection between the various structures at the different meta^{n}-dimensions that would not be clear otherwise. In this way it gives us a very solid foundation for understanding schemas theory and its place within the worldview at large and that is precisely what we need if we are to give a foundation to General Schemas Theory as such. Only a foundation that connects it into the structure of the worldview itself is going to be a solid foundation.

What we see here is a model in which the meta^{n}-dimensional layers function as some type of processing structure for self-organizations that well up from the unconscious. First these self-organizations are divided into the Arche which appear to us as Gods. In a previous study we divided the Greek Gods into male and female and placed them on either side of the chess board as a set of sixteen on each side. This view of the Greek gods as chess pieces in a game/war between male and female is an interesting perspective which yields a structure that is coincident with the sixteen Arche. The Arche represent an unconscious organization of material welling up from the collective unconscious that contains all the various negative meta^{n}-dimensional orderings of self-organization. Being in the negative meta^{1}-dimension the Arche are themselves an unconscious organization of phenomena. But once the phenomena break into spacetime then they are organized by the schemas which are related to specific dimensions. In this case when the phenomena are assigned to a schema they become embodied and organized by that template of understanding. But those templates of understanding are articulated themselves by the kinds of Being as meta-levels in which they are articulated as we have already mentioned. And each of the meta-levels of Being can be expressed in terms of the aspects of Being, i.e. truth, reality, identity, and presence. Those aspects of Being are in turn connected to the regions of Being, which are the two duals and the nondual. These are related to the three possible algebras and the three possible geometries and other similar fundamental mathematical structures. I have an interpretation of the fundamental duality at meta^{4}-dimension and the three ones that make up the trinity. That theory is related to Plato's divided line. Rather than reifying them into merely the necessary dualities of our dualistic worldview and its Trinitarian proclivity, I

would like to interpret the duality at meta^4-dimension as the limits of the divided line which correspond to the supra-rational and the paradoxical. If we can relate this fundamental duality to the limits of the divided line then we can see the three ones as the basic nonduals which are emptiness, manifestation and void which are the lines that divide the divided line. In this way levels meta$^{4-7}$-dimensions become a picture of the divided line of Plato. This is much more conducive than the reified view that would see meta^4-dimensional as merely nihilistic duality and meta$^{5-7}$-dimensional as fundamental trinity. This hooks the structure of the worldview into a fundamental definition of its structure using the divided line ratio put forward by Plato which is a primal intellectual scene in the tradition. It means that the structure of the worldview as we are discussing it becomes merely an elaboration of the divided line of Plato. Plato's divided line unfolds from its own structure at meta$^{4-7}$-dimensions down to the regions, aspects, standings, schemas, and arche. Notice how this gives an excellent structure for considering the nature of the schemas within a broader context as we would expect any truly foundational theory to do. We see how schemas are the first conscious organizing structure and how they feed into the meta-levels of Being that articulate each schema which in turn are articulated into the aspects of Being and so on up the ecstasy of the meta^n-dimensional stairs as we move toward the core of the worldview as expressed by the divided line of Plato. Having a theory that connects into the basis of the tradition in Plato has a lot going for it, as it allows us to bring to bear the leverage of the tradition on the problem of the nature of the schemas within this context. Up until this point the divided line of Plato was not considered to be that important other than as an analogy along with other analogies used by Plato, of which the cave analogy was considered more significant. However, the divided line analogy is between that of the Sun and the Cave and so we can think of it as very significant because of its central position in the set of analogies. However, to my knowledge no one ever asked about the nature of the lines that divide the divided line. My answer to that question is that they represent the nonduals of emptiness, manifestation and void. This is to say that they represent the standings of existence and manifestation while what lies beyond the divided line represents what is non-manifest. We can even line up the separate segments of the divided line with the aspects of Being and the nonduals. In other words on the side of doxa is the division between right/truth and identity/presence while on the side of ratio we see the difference between the representable intelligibles of order/right as opposed to the non-representable intelligibles of good/fate. The sun of the good is balanced by the rainbow of fate in the Myth of Er. The point of the divided line is to orient us toward the nonduals, i.e. the invisible nonduals such as the source of the good or fate which reason can deal with but which are ultimately non-representable. This is the difference that appears at the level of the articulation of the three regions of the two nihilistic duals and the non-nihilistic non-dual that secretly connects them.

Once we identify the doxa portion of the divided line with the aspects and the ratio portion of the divided line with the nonduals then we can see that the divided line relates not just to meta$^{4-7}$-dimensions but also to meta^2-dimensiona and meta^3-dimensions as well. In fact the nonduals are defined by their secretive relation to the nihilistic dualities produced by the tradition at the level of the meta3-dimensional that is articulated in terms of regions, two dual and the other nondual. On the other hand the aspects exist at the meta2-dimensional level. So we can see that the divided line really encompasses the structure of the worldview from meta2-dimensional level all the way up to meta7-dimensional level, especially when we identify the lines that divided the divided line with the emptiness or void of existence and with manifestation the deeper nondual beyond existence. The deeper nondual deals with the qualities of things without regard to their relation to the finite things. Emptiness and void on the other hand deal with the existence of the things that carry

the qualities and not the qualities themselves. When we consider that the divided line carries these traces of existence and manifestation, and also indicates the possibility of the non-manifest as what exists beyond the divided line then we see that in fact the divided line relates to all the various meta^n-dimensions above the level of the schemas. And so this relation of the divided line analogy to the meta^n-dimensional structure gives us more confidence that this structure is indeed central to the description of the inner workings of the worldview.

Of course, Plato's philosophy is all about the Forms, which is the dominant schema from the beginning of the Western worldview right up to the end of the nineteenth century. It is in the Timaeus that Plato really talks about schematization as such, where he discusses the Dimurge's creation of the world by the production of the receptacle which becomes the means of the entry of the source forms into space via the primary platonic solids and two types of triangles. Here is where we learn that forms are either two or three dimensional. We make a mistake when we think of n-dimensional platonic solids as forms, in some sense they are what ever their associated schemas articulate and are not really forms as such. The problem with the concept of the platonic form is that it covers too many different phenomena and thus become really ambiguous to us as we read Plato today. In a way the main problem they are meant to address is how you can have different tables in spacetime that all have the basic outlines of a table template that is outside space and time. This is to say that Forms are sources of the essences of things. But we learn from The Discovery of Things by Wolfgang-Rainer Mann that Plato and perhaps all the pre-Socratics were applying a Pervasion Logic based on Masses rather than a Syllogistic Logic based on Sets. Essences apply to the particulars of sets because they specify the constraints on the qualitative and quantitative attributes of the particulars that allow the differences between set members to be specified. Only different things can be placed in the same set. But if Plato and the other pre-Socratics were in fact using a mass-like or non-count approach to things and a pervasion logic then what they were talking about makes a lot more sense. In the view Wolfgang-Rainer Mann in The Discovery of Things it was Aristotle that turned the tables toward Set-like approaches toward things away from Mass-like approaches of his predecessors. In other words, Tableness is a mass and individual tables are instances of this mass. This is why Plato can build up to the Beautiful as a mass of which all beautiful things are instances. In this reading there is no transcendent Platonic realm needed to hold these source templates. Rather the problem becomes the relation of essence at the mass level of tableness and the essence of the particular table that has differences from all the other tables with the same essence. It is clear that we need some of the characteristics of the mass and some of the characteristics of the set to solve this problem, that is why I invented a nondual alternative to the Set/particulars and Mass/instances approaches called the Conglomerate of Ipsities. This would allow us to avoid the nihilism of the extreme alternatives of identity and difference posed by set and mass approaches. But the point is that if we merely view Plato's ontology of forms though the eye of the mass approach then suddenly a lot of it makes sense that otherwise is extremely difficult to understand. Of course, his ontology is a moving target as it is under development throughout the dialogues. This development is well rendered by The Dialectic of Essence by Allan Silverman. It would be a whole other thesis to go through that development again here and show its relevance for the development of schemas theory from the point of view of masses. Here our point is that if we interpret source forms using a partially mass-like approach then many of the quandaries of the theory of forms are resolved. And it is clear that it is in the Timaeus, the very last of the dialogues to deal with source forms, the insertion of the forms into space via the receptacle and the invocation of two and three dimensional forms in the process is an explicit reference to the mathematical and geometrical schemas that we are making the

focus of our investigation.

In Plato forms are seen as representable intelligibles and in some cases these point toward non-representable intelligibles as is the case of the form of the Good or Fate. When we understand these as masses then all the instances in the world are seen as being pervaded by the source form, whether representable or non-representable. The masses can be seen as non-transcendental because they are coterminous with their instances. And this makes a lot of sense, to those who speak English, because abstract nouns are treated as masses in English. Because the emergence occurs at the level of the mass, that is why the templates are seen as the locus of reality, rather than the instances. It is only if we interpret the forms as being set-like meta-essences that some sort of transcendental realm is needed because sets have no emergent properties, rather particulars have those properties, and particulars have essences so there needs to be some other realm where the idea or the meta-essence exists, which is very confusing, but all of Platonism is based on this interpretation, because Platonism is ultimately an Aristotelian reading of Plato. Our primary point is that the instances of a mass that appear in the receptacle will need some sort of spacetime envelope for the instance to be defined. Plato defines these spacetime envelopes for his sourceforms (mass instances) as 2d triangles of two types and 3d platonic solids of five types related to the qualities and elements in the context of the Timaeus. If we take the mass like interpretation then these triangles and platonic solids are the embodiment of the instances as schemata. He says that the schemata give rise to qualities of things. This is his basis for his alchemy which claims that any substance can be turned into any other substance by changing the combination of the qualities or elements within it. Aristotle and Plato shared this idea in common. This is the basis of Alchemical Theory. If we look back at the Phaedo which I analyzed in my previous Ph.D. called The Structure of Theoretical Systems in relation to Emergence, then there we see that Plato considers the qualities and things to operate in completely different ways. Opposite qualities never come together, while opposite things destroy each other if they come together. Source forms operate on the principle of opposite qualities according to Plato. So the question is how do we produce opposite things in existence, for this it is necessary to have schemas that embody those things which are imbued with opposite qualities. Plato solved the problem by creating a structuralism of quality, saying along with Empedocles that all qualities are a combination of hot, cold, wet, or dry, which is basically Yang and Yin, if you think about it. And that these Yang and Yin spectra in combination produce the elementals: Earth, Air, Fire, and Water. It is combinations of these quanta of the schemas that produce the qualities in things at a structural level within the gross forms of things. This structural level is where the schemas as spacetime envelopes where the instances of the source form masses appear as instances. The mass of fire appears in all the instances of fire. The mass of water appears in all the instances of water. The combination of the elements within the overall form of the thing gives it a specific set of qualities, and if we change that structural combination then we can change the nature of the thing, explaining the transformations that occur in the world around us, such as chemical transformations, and the growth processes of the physus. So it can be seen from this example that the relation between form and structure were built in from the very beginning of our tradition. The Timaeus was the one Platonic Dialogue that was not lost in the West. It is the one most like Aristotle, and so Aristotle and Plato were considered prior to the Renaissance to be synonymous. It is only with the finding of the lost Dialogues of Plato in the Renaissance thanks to the Arabs that it was realized that Plato had a different and some would say deeper understanding than that promulgated by the followers of Aristotle during the Middle Ages. The rise of modern Western Science was in some sense coterminous with the rise of Platonism even though Science itself remained mostly influenced by Aristotle rather than Plato.

In fact we can see that in this analysis there is all three schematic levels that appear as the most prominent to us today. There is the receptacle which is space. Within the Receptical appear the triangles and platonic solids that are instances of the fire, earth, water and air source forms, or masses. These are the structural elements that make up the overall gross form which takes on its shape by imitating some other source form that pervades it as an instance, for instance it might be a table instance of the table mass comprised of all table instances. Notice we do not need to posit a transcendental realm for some meta-essence of the table to exist in as Popper might assume from his reading of Plato. But the mass of tables is then a system comprised of all the instances of tables that are forms which have a special mass-instance relation. We can posit other masses like furniture of which table is an instance along with other sorts of objects such as chairs, as shays lounges. It is only when we ask the difference between tables and chairs that we have to construct a set based on differences and then construe the essences of each different member of the set. No meta-essence projected into a transcendental realm is necessary if we merely shift back and forth between set and mass approaches at the appropriate time. Our point is that the system, form and structure are all present in the conceptual system offered by the Timaeus which is the most sophisticated of Plato's ontological dialogues, and the one where the schema is posited as the instancing of the form of fire, water, earth and air at a structural level within the receptacle created *dues ex machina* by the Demiurge. But the introduction of the structural level Plato and Aristotle get the alchemical transformations between substances that they believe is a fundamental part of the structure of the physus. And eventually we find out this is true when Mendeleev discovers the atomic table, it just takes too much energy to make these transformations feasible in our world except in extraordinary circumstances such as when we try to build new atoms to produce new elements. These structures are set like, i.e. they are composed of different things, two types of triangle and five types of platonic solids. On the other hand the systems are masses of instances of objects of different types that perhaps form a solution like furniture. In the systemic masses the emergence is at the level of the mass while in the structural sets the emergence is in the particular with its own unique essence different from all the other structural components. The level of the gross form is an intersection or mixture between the set and the mass. With respect to the structure it is an emegentless set that is just a bracketing of all the structural components within a gross form, so much air, water, earth, and fire. With respect to the mass it is an instance of the mass which is pervaded by the essence of the emergent properties of that mass, like tableness. So the form as a middle ground between these two levels of emergence has no emergent properties itself. It is merely a set instance between the emergence of the mass system and the set structure. It is merely a spacetime envelope in which these structural units are gathered and which is an instance of the specific mass that is referenced.

If we understand that the Timaeus gives us our fundamental prejudice toward the forms but that at the same time it defined the structural and systemic levels adjacent to that schema as a way of defining that schema, then it is understandable why our tradition has not ventured very far from the formal structural system such as we see in Klir's Archictecture of Systems Problem Solving to this day. System and Structure were implicit in the definition of the Form Schema which was taken to be preeminent, and these other schemas only came into their own right in the last century. It is only fitting that we start off the new century by looking more closely at the other schemas which are implicit in the formal structural system, such as the domain world meta-system as its dual within the hierarchy of the schemas.

Conclusion

In this essay we have made an attempt to link the schemas to the mathematical underpinnings

of the Pascal's Triangle. Then we generalized this linkage by talking about meta^n-dimensions. We realized that the meta^n-dimensions were self-organized by the confluence of rational fibered knots and the meta^n-dimensions. Then we further realized that what we learned about the structure of the world from meta^n-dimensionality was merely a version of what Plato had to tell us about the Divided Line. Once we understood that then we could talk about the place where Plato defines the Schema in the Timaeus, and we showed how that defined the Form schema as two and three dimensional, just as our projection onto dimensionality of the schemas tell us, and we can also see within the Timaeus how Plato implicitly defines both the pattern and system levels along with the form level. In this way we begin to attempt to produce a mathematical grounding of Schemas Theory which is at the same time a grounding in the work of Plato at the beginning of our Western Philosophical and Scientific and Engineering tradition.