# Introduction to General Schemas Theory

## *The Foundations of General Schemas Theory*

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**Introduction**

General Schemas Theory is a new way of looking at our relationship to the things, events, stuff, and times in our world. It is new in as much as it takes a trend that has already started and takes it to a completely new level. That trend can be seen in the development of Systems Theory as a discipline. Systems Theory abstracts from all the disciplines where the system schema is used the essence of the system schema itself and attempts to say in general terms what a system is and what it is good for in explaining and designing things called systems that we find in the world. However, we live in a time where the word system has been applied to everything and where it has been said that everything is a system, and where it is difficult to see where the boundaries of any system is objectively, and so the system fades into obscurity and ambiguousness and becomes less than useful as a concept for understanding things when it started out to appear to have so much promise. This loss of meaning in the concept of the system is a sinking into nihilism, the inability to draw system boundaries is also a sign of dissipation of the concept into nihilism. And due to that nihilism the concept of system has lost its conceptual leverage and explanatory value. In order to solve this problem we need to go up another meta-level beyond the system schema and ask ourselves about the nature of schemas as a whole and in their diverse parts. General Systems Theory concentrates on one schema, "the system". But that schema only gains its meaning diacritically by comparison to other schemas. So General Schemas Theory does for all schemas what General Systems Theory does for one Schema, it attempts to abstract them from all the disciplines in which they are used, to isolate the essence of the various schemas separately, and then to understand where their explanatory and design value comes from, and finally to understand the relation of all the schemas to each other. So if we consider any particular schema being used in a discipline as the first meta-level above the phenomena being described, then the second meta-level is that which Systems Theory has managed to achieve which is to abstract from all the disciplines a particular schema. In General Schemas Theory one goal would be to abstract all the schemas from the disciplines in which they are used locally in order to discover their global properties. The third meta-level is to consider all these disparate schemas in relation to each other diacritically in order to understand the differences and similarities of the schemas. The fourth meta-level is to understand schematization as such that incorporates all the schemas as a whole into a single projection process. The fifth meta-level is to stand outside of this projection process and see what lies beyond schematization in relation to which it gets its meaning. General Schemas Theory encompasses all these meta-levels in relation to all the possible schemas, such as form, pattern, system, domain and world as well as the other schemas. However the path thorough these meta-levels is somewhat torturous and as we shall see requires some work on our part in order to understand all the meta-levels of the schemas within one discipline. However, this work of moving up through the meta-levels

that make up General Schemas Theory is worthwhile because it gives us a completely different view of science and our philosophical and scientific tradition than we could gain in any other way. It is because we wish to gain this vantage point on our tradition, and upon science in general, that is new and different that we make this pilgrimage through the meta-levels of schematization. Schematization is for us a key to the problem that has plagued Philosophy of Science from its beginnings. Philosophy of Science has asked how Scientists discover new ways of looking at things and profound theories about the deep structure of the world. In that quest we see a marriage between theory and experiment though mathematics. However, this role that mathematics plays in connecting discursive explanations to physical phenomena through mathematical analogies is little understood, it is especially difficult to understand why it should work at all, what makes the order of mathematics that are used in our explanations of phenomena cohere with the structure of physical phenomena itself? What we will find is that schematization is the key to this quandary that lies at the base of Science and at the most profound depths of philosophy in our tradition. But to appreciate this we must trek our way though the various meta-levels of General Schemas Theory and understand better the nature of schematization in general. Schematization is a little understood and little explicated concept in philosophy. It is there in the philosophical tradition but it has not been elaborated in significant ways like other concepts have been developed within the tradition. So it will behoove us to look at the concept of schematization as it has developed in our tradition and to understand the connection between schemas that appear in disciplines within academia and in industry and the philosophical foundations for those concepts that appear within the philosophical tradition. So in effect our subject is very broad if obscure and seemingly esoteric. So that this work can only attempt to give the broad outlines of General Schemas Theory which hopefully will be developed by others into a more robust discipline once the need for such a

discipline has been demonstrated. The primary motive of this presentation will be to show the need for the development of this more general discipline at the next meta-level up from general systems theory. George Klir make the point that Systems Theory is orthogonal to all the disciplines. We will make the point that General Schemas Theory is orthogonal to all the Specific Schemas Theory disciplines. In other words General Systems Theory is only "general" because it looks across all disciplines to understand what as system might be. But it is specific when we go up another level and look across all the schemas that have been pulled out of specific disciplines. Each level of generality in this case is in fact a meta-level as described earlier and we posit that General Schemas Theory encompasses all these meta-levels with respect to schematization. But schematization is itself only one kind of social or conscious construct among others and so there is something even more broad than General Schemas Theory that would look across all the other forms of social or conscious construction, invention, explanation, description, etc. General Schemas Theory is in fact only one of the horizons that we need to explore if we are to understand consciousness and our philosophical and scientific tradition that is built up socially. In the course of this book we might touch on the relation of schemas to some of these other aspects of consciousness or of our tradition as it necessary to understand the nature of schematization in general. But for the most part we will limit ourselves to the discussion of schematization for that in itself is a vast subject.

Why has not schematization been a subject of intense scrutiny already by the academic community? This is I think an important question. If it is so important why have not others noticed this possible horizon for research and exploited it? I think that the answer is that schematization naturally hides itself from us. Schemas are something we project on the world as the differentiation of spacetime. It has appeared in the work of Plato, Kant and other philosophers and so has a

strong foundation within the tradition, but it has been neglected, because our projection on the world of nature is overwhelmed by the subsequent perception of the things of nature. In other words schematization is an a priori in Kant's terms and it is overwhelmed by the a posteriori of experience that fills up that vessel of projection with particular things with specific qualities that fill spacetime for us. Where this projection really becomes obvious is in our relations to other people and so psychology, especially psychoanalysis (Freud) and analytical psychology (Jung) spend some time talking about transference as a problem that occurs in therapy. It is recognized that transference is a projection of what is happening in one person onto another person involuntarily in their relationship. Jung refers to these projections are archetypal, i.e. they follow a certain inbuilt pattern that is universal. What is rarely recognized is that we have a similar but much weaker relation of projection with nature. Because of the weakness of the projection we rarely notice it. However, the projections we make on nature are important because it is by those projections we create the spacetime in which the objects of experience appear to us. In other words there is a more general archetypal projection that gives us the spacetime within which we can have a relation with anything else. Because our relationship with nature is more passive than our relationship with other people we rarely notice that projection process in relation to nature. But it is there even in our relations with people as something that under girds all the other archetypal projections. This very weak archetypal projection that Kant called a priori, i.e. prior to experience, has an effect on what we experience. It serves as a filter to our experience. It is Kant that really brought this filter of experience to our attention. But after Kant the concept more or less got lost in the midst of many other revolutions in our thought so it appears only occasionally as an issue that we focus philosophical attention on in our studies of how we interact with the world. You would think it would become a major focus of philosophy of science because scientists project spacetime as the container of

everything. But philosophy of science has been concerned with other issues relating to the logic of scientific discovery and has not focused on the necessity of the projection of spacetime as a basis for experiencing the things that physics and thermodynamics study.

So if others have not seen fit to focus on schematization as an important aspect of our relation with other people and things then why should we now take it up as a subject of study. That becomes a complicated question to answer. But let me say how I became interested in schematization myself. I participated in many email lists when they were first invented where there were many discussions of various subjects between people of all levels of expertise. What I noticed was that in many of these discussions they were talking past each other for a variety of reasons. The one reason that interested me most was when the inability to communicate revolved around using different schemas to refer to the same ontic phenomena. You see one person may see something as a pattern, another person as a form, and another person as a system. They will all be talking about the same thing but in terms of different schemas and thus they cannot relate to how the other people in the conversation are viewing the phenomena in question. This particular kind of lack of communication intrigued me. I started wondering what all the various schemas were that people could use to study and explain phenomena. Was it a limited number or infinite? How were these different schemas related to each other? Is it ever possible for someone using one schema to communicate meaningfully with someone else using another schema? I knew of many different schemas from my own reading of the tradition. I realized that only a few of these schemas had ever been abstracted from their disciplines and formalized. So I started wondering how many schemas had been formalized and I started looking for examples of formalizations of schemas that I knew about. I started keeping an informal mental tabulation of these schemas that would pop up in email conversations on email lists. Eventually I formulated a theory

that the number of schemas were limited and hierarchically arranged. This theory allowed me to start searching for schemas that did not fit into this hierarchical picture.

All this searching for isolated examples of schemas was happening on the backdrop of another research project that engaged most of my effort. That was the discovery of Special Systems Theory and Emergent Meta-systems Theory. These came out of an extension of General Systems Theory into a theory that included the dual opposite or complement of the System which might be called the Openscape or as I called it at the time the Meta-system. The term meta here is used in the sense of 'beyond' meaning the environment of the system. What I discovered was that the system and the openscape were dual opposites of each other and that between them there existed three special systems with unusual properties. These special systems worked together with the normal system to produce a model of the meta-system or openscape. Most of my time was spent trying to understand the relation of the special systems to each other and attempting to find historical models of these special systems and their combination into the emergent meta-system. It turns out that this foreground research topic and the background research topic would eventually unite into a single study for me as I started my research degree at SEEC. When I decided to do a Ph.D. degree at SEEC I began wondering what the nature of the schemas were. All the Special Systems were of one schema type with the System schema in general while the combination of the Special and Normal Systems were of a different schema type, i.e. the Openscape (or meta-system). I began wondering whether there was any connection between this difference in schema types and the nature of the special systems themselves. The special systems appeared between the two schema types of the system and openscape as if they were a different type of schema between the other two giving us partial systems and partial openscapes (or environments of systems). But in spite of their nature of being partially one schema and partially another

schema they formed very definite thresholds of organization that were different from the basic schemas that they were separating yet uniting. Also it appeared strangely that the other schemas I were discovering were in fact repetitions of this difference between the system and meta-system at higher or lower levels of scale. This made me wonder whether the special systems existed between all the different kinds of schemas or whether other schemas were separated by other yet un-discovered partialities. The current theory is that indeed the partial schemas exist as the same thresholds between all the various schemas. However, this question is still for the most part up in the air.

However, for me the real crunch came when I realized that I really did not know what a schema was. In other words I had developed a theory of the difference between the system and openscape and how that led to intermedinate partial thresholds of organization between them called the special systems, but if we asked what a system was or an openscape was or a special system was then I did not know. In fact, I did not know what any of the schemas were in themselves. So I began under the auspices of a research degree at the University of Southern Australia the quest to understand what schemas were so I could understand better the import of the discovery of the special systems as halfway houses between the system and openscape schemas.

I was very fortunate because it turned out that Umberto Eco in his book Kant and the Platypus had done a survey of the subject recently and so I did not have to start from scratch and do that survey work myself. Umberto Eco calls what I call a schema the "mathematical or geometrical schema" differentiating it from other uses of the term. It turns out that the term schema has taken on many meanings and has become just about as confusing as other terms in the tradition that are used in multifarious ways. Fortunately Umberto Eco clearly separates out the mathematical and geometrical schema from all

these other uses and we can identify this meaning with the meaning that Kant intended for the term in his Critique of Pure Reason. We can even see the beginnings of schema theory if Plato's Timaeus at the point where he introduces the triangles out of which the Platonic Solids are constructed as the first formalization of the Form Schema in the Western Tradition. So it became clear that what I called schemas was recognized within the tradition and had a life in the history of ideas. But still if we restrict the concept of the schema just to this meaning that is tied to the work of Kant, Plato and Umberto Eco we see that these philosophies are open to many interpretations which in turn change the meaning of the term "schema". So even if we have a very clear origin within the tradition of the term "mathematical and geometrical schema" we still do not necessarily know exactly what that term means. From now on unless otherwise noted I will use the term schema to denote only what Umberto Eco calls the mathematical or geometrical schemas and will consider that what Plato and Kant had in mind are the same thing. I will seek to use other terms for all other meanings of the term schema. But even this rigor in usage does not allow us to tie down the meaning of the term as well as we would like. It means something like the geometrical dimensionality of the object in question. But in fact schemas are more than merely the dimensionality of an object. This difference and similarity between dimensions and schemas will play a key role in the unfolding of our story. Suffice it to say that dimensions and schemas are very closely related and that is what makes this meaning of schemas different from other meanings of the term that appeared later in the tradition. Understanding the difference between dimensions which is a purely mathematical concept and schemas which is an organizational concept is the key to seeing how schemas act as templates of understanding though the projection of spacetime. All experience is organized by these templates of understanding provided by the schemas because all experience occurs in spacetime. As Ingvar Johannson says spacetime is the

primary or first category in his ontology. Everything that fills spacetime for him are states of affairs, a very general term to cover any kind of entity what so ever. Schematization is the projection of spacetime but not as a plenum but with dimensional articulation such that each schema has its own fundamental organization separate from dimensionality as such. That organization has to do with the schemas use as a template of understanding. As Heidegger says there is some pre-understanding of objects prior to our understanding process. This pre-understanding is provided by the schema and is operative before we know what kind of a thing it is that is appearing. Prior to things being of different kinds they appear within different schemas. First we know that something is a pattern, a form, a system, an openscape, etc before we know what kind of thing it is. Mostly philosophy focuses on kinds of things and this appearance of something as a dimensionally confined organization for understanding prior to its being on kind of thing or another mostly goes unnoticed in our tradition. Schematization as a sort of a priori projection of articulated spacetime within which things can appear draws our attention to this level of Being that otherwise might escape our notice. In fact Schematization has a big impact on our understanding of ontology in general. Ontologies normally describe the kinds of things that have being. What is missing is an ontology that goes to a point prior to when there are kinds of things, i.e. to the point of our pre-understanding of things before we recognize them as different kinds of things. There is a more primordial differentiation of things into schemas that takes place prior to our recognizing them as different kinds of things. This pre-ontological understanding as Heidegger calls it has a specific structure, it is the structure of the different schemas we apply to the things we encounter in our experience prior to our experience of them as specific kinds of things. Heidegger, did not seem to recognize that his idea of pre-ontological understanding had a specific structure of the schema. In this sense we are going beyond what Heidegger said about ontology and

expanding on his fundamental ontology in a way that makes it more precise. Projection of schematization reaches out and categorizes things in terms of their spacetime articulation prior to the projection of the categories of reason and the kindness of things which fill our life with understandable experience. There are templates of understanding that experience fills that appear prior to the categories and the kinds that allow experiences to be fit into the framework of categories and kinds. This is Kant's point concerning the a priori and the fact that space and time come before experience as such. For him schemas are tied to time and related to each of the four types of categories that each form a dialectic. Space is considered to be a plenum and is not recognized to be differentiated into dimensions. The Schemas seem to relate the categories types to time instead. Each category type is a dialectic so we could see the working of that dialectic to be the schema's interaction with time. In this way time is differentiated and space remains a pure receptacle similar to how Plato thought of it. If, rather, we think of time as undifferentiated, because according to G. Lackoff all our metaphors to do with time come from space and there are no purely temporal metaphors leaving time undifferentiated, and instead we think of space as differentiated into dimensions rather than a plenum, then we see the geometrical schema as the differentiation of space instead of time. Plato hinted at this differentiation with respect to the schema *form* in Timaeus. Today we know that space and time are not separate as Kant and Plato thought but are merged into a field of spacetime. Thus we can see that Kant and Plato's ways of looking at the schema are complementary one emphasizing the timelike phase and the other emphasizing the spacelike phase of the projection of spacetime. Where Heidegger does not specify the differentiation of preontological understanding schematization gives us a more concrete idea of that articulation. Thus General Schemas Theory becomes a kind of meta-ontology in the sense that it comes before the differentiation of things and stuff, or events and times, into kinds of things that categories

of reason apply to. It is a meta-ontology because it distinguishes sorts of possible pre-comprehension based on spacetime articulation and the inherent organization of entities that appear within various schematic openings. Heidegger talks about the openness or clearing of Being. Schemas are types of openness or clearing. Heidegger talks in general about clearing and opening but we can be more specific if we talk about the schemas because each type of opening or clearing makes possible the manifestation of a particular sort of phenomena that is prior to its differentiation into kinds. Clearings and openings are not homogeneous plenums themselves but have inherent organization of their own. That is why they bring with them a pre-ontological understanding that Heidegger points out. And these pre-understandings that stand as templates for what is understandable to us are nothing mysterious but appear as types of schema we are very familiar with such as pattern, form, system, openscape, domain etc. They help us not only understand things that appear in experience, but they also help us design things to fit in our world. And this last point is the key because there is a series of templates upon which all our design activities are based here called the schemas. Knowing the nature of the schemas have to help us design systems, forms, patterns, openscapes, and domains better. In design we are projecting our schemas out onto the world in the form of things we build rather than merely accepting experience passively through their medium. And this is why we are interested in studying the schemas because they are a prerequisite for the understanding of our own design activities. Everything we build and place into the world fits one or more schemas. But building these things we are actively projecting the schemas into being through the entities we design in our world. The more we understand the schemas the better able we are to design things that fit into our world synergistically. Understanding schemas are a form of self understanding. It is a little known fact that we project schemas on the world and design by them. If we understand that we can consciously study and use the schema rather

than merely unconsciously doing so. The better we understand ourselves the better we will be able to build things that serve our long term as well as short term interests. We are building things using schemas for ourselves. When those things create problems for us and our environment that were unforeseen then those very products of our own labor become alienating for us and for other creatures that share the planet. When schematization goes wrong or is misused or unused then what we get is a sick environment, like the case of sick buildings, and that leads to sickness in ourselves and other living creatures like ourselves.

In this introduction we have taken a broad swipe at several fundamental questions that must be considered in more detail in what follows. In order to place schematization in the right perspective and in order to build up the case for the necessity of General Schemas Theory as a discipline we will have to consider many different subjects in some detail. For this reason our argument will appear to be somewhat convoluted. This is necessary because the schema is something hidden in our tradition and its significance is not immediately apparent. Many times we only find out about the schematization by considering other subjects that appear unrelated. There is no way at this time to step directly into the subject and give it a treatment like a course book might do. Rather our approach to the subject of schematization must be circumspect because it is an aspect of ourselves that we hide from ourselves. Bringing it to light and exploring its implications is something that must be done with some caution and subtlety. But the implications of General Schemas Theory itself is far from insignificant because everything we design is based on our intuitions about it. Also everything we experience goes through the filter of the schemas. So the schemas are a very pervasive underlying organization for our experience and we project that set of organizational templates on things before we even recognize them as different kinds of things. Then we also project these

organizations through the things we design and build that become part of our environment and thus in turn enforce that projection that we make in the first place before it is amplified by the built environment.

It is strange that art historians or cultural anthropologists have not developed a theory of schemas long before this. But in both cases these students of human productions look at the things that are produced by artists that re part of culture rather than the field that was projected out of which those things arose as constructions. Here we are attempting to study the fields out of which cultural artifacts and in fact all things sensed arise. There are different fields that overlap and nest but with very different organizations that impress their organization on the cultural and natural world as we experience them, because they are a priori projections prior to experience. But this work on General Schemas Theory should be of interest to anyone who deals with any kind of constructed object, or even natural objects that are experienced because it exposes the articulated backdrop out of which these artifacts and natural formations arise. I believe that General Schemas Theory will become a broad discipline within academia that will be interdisciplinary. Once it is realized that schemas show up in all disciplines in different ways then what has happened with general systems theory will happen on a much more broad scale within academia. General Schemas Theory is inherently interdisciplinary. It is the means by which different disciplines can pool their findings about the process of human projection processes in general. We have something to learn from psychologists and sociologists and anthropologists on this score, but no one to my knowledge has brought together the study of the templates of understanding themselves as a subject of study. Rather we study the diverse materials produced by many cultures including our own that go through the filter of the schemas. But let us turn that mirror around and instead look at an aspect of ourselves that is rarely studied, i.e. the projections we make onto things by which we pre-understand them in terms of how

they fit into spacetime as differentiated rather than being a homogeneous plenum. Once we turn that mirror around and look through it as one looks through a one way mirror, then we begin to discover the pervasiveness of the schemas and how they organize our experience in very broad and far reaching terms including organizing everything that we build or experience. By knowing about these involuntary archetypal projections of schemas we learn about a subtle but pervasive aspect of ourselves which may also help us understand our place within the world because we schematize not just other things, but we also schematize ourselves. By this self schematization which we perform in concert with our fellows we introduce reflexive autopoietic dissipative special systems into the center of our experience as the axis around which our lifeworld turns.

**Long Term Research Program**

In this section I will describe the long term research program that led to this endeavor to understand the foundations of General Schemas Theory better. I graduated from University of Kansas with degrees in Sociology and East Asian Studies. Then I went to study Sociology at London School of Economics which is part of the University of London at a time when Philosophy of Science was an emerging topic and became involved in that research area. I did a Ph.D. degree with the title "The Structure of Theoretical Systems in relation to Emergence." I originally wanted to the topic of the sociology of creativity based on work that had already been done in sociology of religion but found there was not enough material to base such dissertation on at that time. Instead I become involved in looking at creativity in science through the paradigm of emergence developed by G.H. Mead. I looked at structural changes in theoretical systems in science as creative discontinuous emergent events. I looked at the philosophical foundations of scientific discovery based on the newly translated works of Continental Philosophy and the relevance of fundamental ontology to scientific discovery. However, I

attempted to understand these proposed new kinds of Being that were being proposed by continental philosophers within the framework developed by Russell and Whitehead in Principia Mathematica and the Theory of Higher Logical Types that was developed to resolve paradoxes. Being as a concept is of course the biggest paradox of all. In that work I found that there were four kinds of Being defined by meta-levels and that genuine emergence involved passing though all four of these meta-levels of Being. Artificial emergence that contributed to nihilism appeared when all four kinds of Being were not involved in the new thing that was appearing in the tradition, be it a theory or a phenomena observed by experiment. Thus I discovered that by looking at Continental Philosophy in a way organized by Logical Type Theory one could explain after the fact the structure of emergent events that many times appeared as changes in theoretical perspective such as the arising of new facts, theories, paradigms, epistemes, or ontological interpretations. After eight years of broad reaching study of many disciplinesand philosophical theories, but always using Systems Theory as a foundation, my research came to an end and I returned to the United States.

Upon my return to the United states at the end of a recession and at a time when there were no academic prospects I decided to go into the newly emerging field of Software Engineering. I got a job in this field locally in my home town of Kansas City, and was shortly transferred to California and made a Systems Engineer. I had a brief stint as a Systems Engineer in a company that made Restaurant and Hotel computer systems and who wanted to enter the Hospital computing market. My next job was as a Software Engineer writing a real-time system. After that I was hired by Rockwell who became Boeing as a Technologist concentrating in Processes, Methods and Tools for Software Engineering. After leaving Boeing I started to work at Raytheon as a Systems Engineer doing Process Improvement work in Systems Engineering

based on the CMMI. Now I am working as a Systems Engineer on a project related to radio based networks. See my resume at http://kent.palmer.name for more details.

During this time as a Software and Systems Engineer in Industry I continued my own research program. First I applied my Philosophical and Systems Theory Training to understanding the enigma of the problem of Software. I wrote a paper on Software Ontology that recognized that software was an emergent cultural artifact that closely embodies the nature of Hyper Being or what Derrida calls differ*a*nce. I went on to use this knowledge as a basis for understanding the nature of Software Design Methods. I wrote a series of working papers called Wild Software Meta-systems and also published a paper in George Klir's journal summarizing my results which appears as the introduction to that series of working papers. Sometime after that I wrote a book called The Fragmentation of Being and the Path Beyond the Void which is a wide ranging study of the nature of the Western woroldview. That book contains a close commentary of Plato's Laws and a systematic analysis of Plato's cities that appear in several of his works. The oddities of his cities and their relations to each other gave me the first glimmerings of what I now call Special Systems Theory. Subsequent readings of Plato have shown that his work is laced with examples meant to explain special systems theory but which have not been understood properly in light of systems theory by the Western Tradition. So after finishing that work I wrote another series of working papers called "Autopoietic Reflexive Systems Theory" and a summary of the research results that appears as the introduction called "Reflexive Autopoietic Dissipative Special Systems Theory." Since then I have written many papers that have been presented as various conferences that have attempted to spread the word about the existence of Special Systems Theory and its extension called Emergent Meta-systems Theory. Basically I have spent ten years after the discovery of Special Systems Theory in about 1994 researching the implications of that

theory and attempting to find other historical embodiments of that theory. This work has been a wonderful intellectual adventure and I am happy to have been able to explore this new intellectual territory that hearkens back to things known earlier in our own tradition and the traditions that we have forgotten, but are very significant for us today.

In about 2002 I decided to attempt to go deeper into this subject by doing a second Ph.D. in Systems Engineering at SEEC. I took the title for this research project as The Foundations of Emergent Meta-systems Theory and Practice. But the goal was to discover the nature of the schemas which underlies the Special Systems Theory and normal Systems theory as well as the dual of Systems theory which I have called Meta-systems Theory. Papers on Meta-systems Theory have been presented at the INCOSE conferences in 2000 and 2002. But in order to understand what a system was and what a Meta-System was not to mention special systems I had to compare these schemas with other known schemas such as pattern and form and attempt to establish what I now call General Schemas Theory. To this end I wrote two series of working papers that appear at my research website at http://holonomic.net. In the first series which I dubbed the anti-thesis I went through each schema one by one and said what the formalizations of that schema were that I knew about and tried to consider each schema in relation to all the other schemas. Having finished that work within the first four or five months of my starting my research, I began reading widely about the use of the term schema in the tradition. Fortunately a summary of this research had already been done by Umberto Eco in Kant and the Platypus which I found right away and was able to give context to my own researches. One of the major sources of my own attempt to understand schemas in this research was Difference and Repetition by G. Deleuze. Eventually I discovered that the Schema in many ways was the inverse of the concept of Emergence on which I did my first dissertation. When something emerges it first appears in a schema before it appears as some kind of thing, as a

specific individual with differences, or is given significance. So this realization allowed me to apply some of the results of my previous research in my quest to understand schemas. I reviewed the various uses of the term schema and determined that the meaning I was interested in was what Umberto Eco called geometrical or mathematical schemas rather than the other meanings of the term that have accumulated. I found that this meaning was first introduced by Plato in the Timaeus, which was the only work by him known in the West until the Renaissance. I also found that this usage was formalized by Kant in his Critique of Pure Reason and this was later interpreted by Heidegger as part of his appropriation of Kant as a forerunner of his philosophical position. After the introduction of the word schema into the tradition it came to be used in many different meanings, but those of Plato, Kant and Heidegger are most germane to this study as they are the philosophical core of the usage of the term. After researching the prior use of the term to a certain extent I began a second series of working papers on General Schemas Theory with the intent of focusing on the genealogy of the term in the philosophical tradition. But this series turned out very differently than I had expected and began to focus on the mathematical rather than the philosophical basis of schemas. This set of working papers can be seen on my research website as well under the title foundations. In the process of writing these working papers I also undertook another set of papers on the reformulation of my concept of the Metaphysics of Emergence based on the hypothesis of the existence of a fifth kind of Being called Ultra Being. It was hypothesized that Ultra Being was involved in the metaphysical basis of Schemas. Only two papers have been written in this series so far. But all in all the research into the foundations of schemas, both mathematical and philosophical turned out very differently from expected. It started with the discovery that schemas were intimately related to dimensionality and that there was a specific relation between dimensions and schemas such that there are two dimensions per schema and

two schemas per dimension. After exploring several implications of this and some other related avenues for the understanding of the nature of schemas, then I eventually found a way through the work of Michael Taussig to understand the quadrate structure of the individual schemas that determines their emergent organization at each level of their hierarchy. This working paper called "Transformational Schematic Representation, Repetition, and Mimesis across Dimensions" provided closure to the search for the basis of schematic organization. Both the dimensional generator that produces the hierarchy of the schemas and the internal structure of the individual schemas are driven by special systems theory. It is this discovery that has led to my wanting to write a summary of this research in a new work that condenses, explains and provides context for this discovery about the nature of schemas. It is not that the horizons of research into the nature of schemas have been closed off but rather that they have been opened up for further exploration by others. This current work is intended to lay out this new horizon in such a way that others might be able to see their way clear to entering this new horizon and continuing the exploration process, because with this tentative understanding of schemas comes the possibility of re-understanding the emergent Western tradition anew in terms of schemas and their development in disciplines and their interaction across disciplines even if that interaction has been in many cases action at a distance.

The point of this section is to explain that this work is the result of a long involved research program that only led to schemas after many other subjects had been explored. The importance of schemas was not obvious from the beginning but only now becomes clearer as we begin to understand the mathematical and philosophical foundations of schemas and their relation to the problem of Emergence within the Western Scientific and Philosophical tradition. It is rooted in the early work by Popper, Lakatos and Feyerabend in the Philosophy of Science. Although here it is

being applied to an emerging new discipline, Systems Engineering, which needs to understand all the schemas in order to give the term "system" meaning, it has general importance for understanding the dynamic unfolding of Emergence within the Western Tradition itself. The Metaphysics of Emergence is transformed once we realize that Ultra Being at the fifth meta-level probably exists and that kind of Being is significant for our understanding of the nature of schemas. So in a way this new work is a return to the original concern with the nature of emergence now recognizing there are five meta-levels of Being involved instead of only four. An invited presentation to the CSER 2004 conference was made on this topic of the "The Foundations of General Schemas Theory" that summarized these interim results. In many ways this paper provides the background for understanding the points made in that presentation. And that presentation gives us a starting point for further exploration into the mathematical and philosophical basis of schemas theory. A long and winding research track has led to this point. It is not easy to describe what the steps were and how the various clues were put together to lead to this result. The best thing to do is read the various papers that were the tracks of that research agenda playing itself out. They are all available on the web. Many things thought to be correct at one time were shown to be wrong at a later time and so there was an evolution of thought that brought us to this pass. However, not that we are here, we can survey the vista that lays before us in which Schemas Theory and Emergence have become intertwined. Throughout I will be using Systems Engineering and Systems Theory, those estranged sister disciplines, one academic and thus ensconced in logos and the other industrial and thus mired in physus[1]. Mostly they do not know about the existence of each

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[1] I use physus to mean phusis because most people do not know what phusis means but can readily read a meaning into it if we change the transliteration to physus. It is a greek term that indicates growth and development in nature as logos means the unfolding of language in speech.

other and the main thing they have in common is the use of the word system which is a very popular schema right now and which is overused and applied to everything under the sun until it has lost its meaning almost completely. If we restore some bit of that meaning we will have been successful. The meaning of the term "system" is based on the comparison with other schemas. Both systems theory and systems engineering need to become part of a broader disciplines of schemas theory and schemas engineering in order to preserve and make more poignant their meaning. Schemas Theory is necessary for all the separate disciplines that concentrate on the development of specific schemas as a means of comparing and contrasting their various uses of the same schema across disciplines or different schemas within the same discipline. Schema's theory is about our own projection of timespace or spacetime as a differentiation rather than as a homogeneous plenum. All disciplines project spacetime or timespace in some manner. As Ingvar Johansson, says spacetime is the first category and after that come states of affairs within timespace. All disciplines deal with some states of affairs in timespace or spacetime in one way or another. But no discipline concentrates on this projection process itself that Kant calls a priori, because until now it was not generally recognized that spacetime or timespace were projected not as a homogeneous plenum but as a differentiated pre-structuring of phenomena that we are calling schemas, i.e. as predefined templates of understanding for phenomena prior to experience cast upon the ontic emergent levels of phenomena as our means of understading them. Science itself is basically a discovery, by slow pain staking process of the isolation of anomalies of the differences between the projected schemas and the organization of the emergent levels of phenomena themselves. Science must project the schemas as a first hypothesis which when refuted allows us to see as though a glass darkly the outlines of what is really out there beyond our projections. Projecting schemas is an important first step which is often overlooked. It was Kant's

brilliance that he realized that this first step must be there hidden beneath a posteriori experience. Prior to that it was thought that space and time were objective realities unrelated to human experience of the world. Just like we discovered that we are implicated in experiments at the quantum level of phenomena, it is a little understood prior assumption that we are implicated in the projection of the spacetime or timespace matrix prior to our implication in those experimental outcomes. Schemas theory studies this underlying projection process prior to experience. And it is important because emergent phenomena is like all phenomena in as much as it appears first in schemas. Emergence is emerging into schemas before all else and thus there is an intimate relation between the emergent event and the structures of the schemas. They are implicitly intertwined in ways that are both amazing and subtle. Understanding schemas is a step forward in our understanding of ourselves and our Scientific and Philosophical Tradition which has neglected the concept of schemas. Through schemas it is possible to re-vision our tradition in technology, science and philosophy. This work will hopefully be a first step in this process of re-visioning.

**A Revolution in Thought**

Essentially what we are seeing here is a revolution in my own personal thought. This would have never happened if I had not undertaken a second Ph.D. Basically my underlying ontological assumptions remained stable after finishing my first Ph.D. up till I started my second one, and the change in ontological assumptions in the course of studying Schmas was very unexpected. A Ph.D. forces you to dig deeper than you would otherwise even in subjects you know well. The result of my digging deeper was the discovery of a way that Ultra Being could exist and the surprising fact that it was related however tenuously to the schema. In this work I want to explore fully as possible the implications of this revolution in my own thought. Whether it will have any effect on anyone other than

myself is still up in the air. But here at least I can record my own astonishment and wonderment at the emergence of a new kind of Being. It had always been there of course, but I did not realize that it existed. It took the build up of anomalies to its denial over the years for this fact, theory, paradigm, episteme, ontology, existential shift to occur suddenly on a plane ride back from the Social Theory conference in Tampa Florida in 2003. Suddenly I realized that all the anomalies that had built up in the face of my denial of Ultra Being could be resolved and the phase transition between Being and Existence at the fifth meta-level could be preserved by a very simple hypothesis. From that point forward I toyed with the idea that Ultra Being might exist. But what cinched it for me was the discovery that there was a tenuous connection between Ultra Being and Schema Theory. From that point began a revolution in my thought that I will try to explain and carry forward in this work. Not many of us who are mature scholars experience a complete revolution in our thought. In fact, the whole tradition is against that. We are suppose to figure out everything and then hold onto a single point of view on it all throughout our career. We don't get any points for changing in midstream our whole idea of how things work, or how they stack up as a whole. Theorists who change their mind are somehow thought inferior, unless like Heidegger they base their own fame on the ability to change. But those who pass through a dark night of the soul and change their approach to things are not overly esteemed. Better to be wrong and stay wrong rather than be inconsistent, incomplete or unclear, as if thought were a formal system. Even Hegel who taught the process of thought was dialectical did not change his mind about the dialectic and how it worked. Only Sartre took up the challenge of making the Dialectic Dialectical in Critique of Dialectical Reason. But the difference of his thought between Being and Nothingness and his later work is hardly mentioned. The *Turing* in Heidegger's thought is made much of with few realizing is that he was always turning to new ways of looking at the essence of fundamental

ontology. This revolution in my own thought is quite different from these and other cases of mature thought differing from first thoughts. Rather in my philosophical program there was always a structure of the infinite series of meta-levels that come from Higher Logical Type theory. What was strange was that there were only four recognizable kinds of Being that filled out this infinite stair case and that there appeared to be a phase transition at level five into existence. There was always a possibility that a new kind of Being would appear at the next meta-level, and I always said that should that occur it would revolutionize our world of thought. I searched for the fifth kind of Being in the works of others and tried to think it myself and had come to the conclusion that there were no examples and since I could not think it myself I figured it did not exist. However, it is difficult to prove that something does not exist especially something at a high meta-level of Being which is inherently unthinkable. But the denial of its existence in many ways drove out all the inconsistencies and anomalies that arise when it is denied. I talk about those in my papers on the Metaphysics of Emergence. The key point here is that I always said that it was an open question whether a fifth meta-level of Being existed. I even gave it a name just in case of Ultra Being. And I always said it would transform our world if it could ever be found to exist. Well this is the tale of how one finally bows to the weight of the evidence and concedes after many years of denial that Ultra Being probably does exist. However, this is not good news. Each kind of Being discovered before was more and more difficult to understand. Ultra Being is impossible to understand. That being the case it would be better for all of us if it did not exist. However, it makes certain intractable phenomena like poison, sin, and evil easier to understand if it does exist. In other words Ultra Being makes the world a harsher place not a better one. That was one good reason for resisting it. But once we decide it does exist, perhaps, I still cannot commit to it, then certain wicked problems become easier because of their embodiment on the ontological level. So in effect my world has

become more vast by magnitudes with the partial acceptance of the hypothesis that Ultra Being exists. I am now in a search for historical instances and embodiments of it. But here we will be discussing in detail one possible embodiment of it which is related to the concept of the Schema itself. What I had realized was that I had always viewed emergence and the kinds of Being from within the world, never from outside it. When you step outside the world and see that emergence within the world is caught up in the four kinds of Being at lower meta-levels, then it makes sense that even Being should have an outside, and thus a kind of existence as projection not as we are caught up in it but viewed from an external position not caught up in it. For instance, there is the way Being as projection looks from the point of view of enlightenment either through the realization of emptiness or void. This way that Being looks from the outside is what I have called Ultra Being, it is Being as an existent. We can think of it as what differentiates the schemas from each other ultimately. If we just think about things or stuff, events or times and not their context, i.e. the schemas which are the projection of the differentiated spacetime/timespace matrix then the four kinds of Being are all we need. But if the differentiation of spacetime/timespace into schemas is prior to the things or stuff as the meta-system into which the things or stuff come then we must ask ourselves what differentiates the schemas as emergent organizations of spacings and timings from each other. It has to be Ultra Being. When you think about it this way it is so obvious. But it has this pernicious cosequence that we must live with the fact that Ultra Being as the incomprehensible is wandering around out there in our world, that it might express itself as poison, sin and evil, and it means that Pandoras box is open again and there is nothing stopping there being even higher kinds of Being than Ultra Being that are even more incomprehensible. So Ultra Being's existence is a bad consequence, if true. But on the other hand Ultra Being's existence expands our world in ways possibly only explored so far by philosophers like Bataille and others of his ilk

which celebrate the perverse and the absurd of the truly incomprehensible. In a way the existence of Ultra Being means that there is something more opaque than the unconscious of Jung or Freud. The unconscious is still related to consciousness. What if there is some part of Being that is unrelated to consciousness, something like what Michael Henry calls The Essence of Manifestation interpreted with emphasis on Henry's quotes of Meister Eckhart. My previous interpretations of Henry's work in the working papers for my dissertation in England must be reevaluated in the light of the possibility of Ultra Being. Henry posits that there is a part of manifestation, called the Essence, that never manifests. This could be interpreted as a fundamental ontologists view of the unconscious, and thus something that appears at the Hyper Being level. But it could also be interpreted as something radically other, something completely incomprehensible, or alien in which case it starts to sound like Ultra Being. What ever Ultra Being might be and whether it actually exists is an open question right now, but just its possibility of existence, shatters old ways of looking at things and reorganizes my thought in a revolutionary way. Here you will see first hand the traces of that revolution in my thought, which is not just a change of opinion, but the fulfillment of a dread. Opinions are easily held or forgotten. Considered opinions are usually turned into dogma. Dogmas are what define the difference between what Sextus Empiricus calls the sophists and the academics. Sophists have positions and academics deny those positions. The skeptic tries to keep the conversation going in hopes that the truth will turn up. But it is different to construct a meta-ontology that has slots for other meta-levels of Being without having any examples to fill those slots. Those meta-levels can turn up and fill out one's meta-ontology. It is shattering when it occurs. You realize that the world has just grown much more dense, complex and its horizons have been expanded further. The dogma of the denial of Ultra Being was a fond hope for a better more comprehensible world. When that hope is shattered by Ultra Being

acting like it might show up, then that itself is an emergent event, a genuine emergent event because what shows up changes the possibilities of change itself. The fact that this emergent event in my own thought is related to the analysis of the relations of schemas to each other is very unexpected. This work will explore this new territory gingerly. William Gibson whose works I do not read made an interesting film about himself called "No Maps for These Territories." That is the way I feel about the existence of Ultra Being. I just don't know where it might lead if it turns out to be true. But one of the premises of this work is that Ultra Being might be true and we will be exploring the implications of that for General Schemas Theory, because Ultra Being might be part of its foundations, and this is a work about foundations. This means that the neglected concept of Schema which really does not seem very interesting, might have a hidden punch, in as much as it is intertwined with the possibility of Ultra Being. I don't know if it will effect anyone else's thought but the possibility has certainly effected my thought. Here we will take some space to explore the implications of that revolution in as much as it is related to the foundations of General Schemas Theory.

**Implications of This Work**

General Schemas Theory is developed as an academic discipline to form the basis of Schemas Engineering which is the logical expansion of the industrial discipline Systems Engineering in light of the discovery of Schemas Theory. Thus it is envisioned that this theory has practical results in our ability to design more and more complex systems, environments and other schema related artifacts. Since all artifacts must fit into some set of schemas that means the design of all artifacts are deeply influenced by schemas theory. Schemas each have their own unique emergent organization that forms a pre-ontological template of understanding that goes before our design work to understand what we can design and how. We use the organizations of the schemas as a pre-design of

what ever we are designing. Understanding that proto-design template and how it relates to other such design templates can only improve our ability to make designs work. Once we understand the substructure of the various schemas then the question arises what are the methods, tools and processes that apply to design at that level of organization. I have developed a vision of that for the form level in my research on software *minimal methods* in the Integral Systems Engineering Method that is developed in my electronic book Wild Software Meta-systems. Something similar exists as "Unified Modeling Language" which has become the industry standard in Software Engineering. Now there is under development UML 2.0 for Software Engineering and SYSUML explicitly for Systems Engineering. But it is an open question as to the design methods, processes and tools for the other schematic levels. One practical step that would be worth taking once we understood better the nature of General Schemas Theory would be to attempt to derive those methods from what is known about the formalizations of these various schematic levels. Another whole question is how to produce formal methods that cover the schemas and help us reason about our models developed within the context of the various schemas. But all this work with respect to informal and formal methods is dependent on having a theory of the organization of the schemas themselves. It is difficult to even think about going on to that next step until we are sure that we have a clear picture of how the schemas are related to each other and how they are organized in themselves.

Schemas tell us something about ourselves as human beings as they are involuntary projections, what Nietzsche called true lies, i.e. lies that are necessary for our survival. We could not survive unless we could project things, stuff, events, times into existence through their being designed. And ultimately our survival as a species will depend on our starting to integrate our designs with nature in such a way as to minimize unintended consequences of our designs. How can we ever hope to do that unless we understand our involuntary projections that become embodied in our design, through our projection of spacetime or timespace before our experience. A priori means that all experiences already come embedded in the matrix of spacetime or timespace. They are already warped by its assumed order that may differ from the inherent order of ontic phenomena we encounter as emergent levels beyond our projections. This invisible warpage of experience which has its own organization at each schematic level is an important part of how man becomes the measure of all things. Protogorus was right to the extent that Schemas are based on scales, and we apply those scales to various phenomena in our experience. At each scale we lock into an assumed schema automatically. We might at different times apply other schemas to the same phenomena. Different people might apply different schemas to the same phenomena. When different schemas are applied then the phenomena seems to change its organization implicitly based on the organization of the schema. This implicit organization that we are assuming may be different from the inherent organization of the phenomena itself. Science is our main means of divining the difference between projected schemas organization and the inherent order of the phenomena in itself that is covered over by schematization. When we first start looking at anything it is our own schemas that are the first order we see. Later we realize the difference between the schematic order and the order of the phenomena itself. Much later we realize that the schematic order is a projection and that all schematic projections of the same type are related and thus can be raised out of the disciplines to its own level as a discipline of its own. Seeing the phenomena as ordered by a schematic projection is the zero meta-level of projection. Seeing the schema within the discipline is the first meta-level of projection. Seeing the schema across disciplines is the second meta-level of projection. Seeing the schemas in relation to each other is the third meta-level of projection. Seeing Schemas as a whole or single projection process is the fourth

meta-level of projection. Seeing Schemas as different from other human cognitive functions or human faculties is the fifth meta-level of projection. In order to understand schemas we need to explore all these meta-levels of schematization, which are in fact the same as the meta-levels of Being and in fact the meta-levels of Emergence. Being is projection and it breaks up into meta-levels and gives us new things emergently in qualitative quanta of emergence at various meta-levels as well. So the discipline of General Schemas Theory is intimately connected with fundamental ontology. However, we often do not think about it because we assume that whatever we define as being the topics of our ontology are static kinds that then are particularized as individuals. But this view is myopic because first something has to be embodied in spacetime or timespace before it can be any kind of thing or any individual particular. So schemas come first prior to kinds and individuals. Schemas have to do with embodiment within differentiated spacetime or timespace rather than in the imaginary homogeneous plenums that scientists and philosophers since Descartes normally imagine. Spacetime and timespace is broken up by dimensionality. Dimensionality is the dual to Schematization. Dimensions have order determined by their possible Platonic, Archimedean and other closed polytopes that can inhabit them. There may even be fuzzy dimensionality that is between dimensions. But this order of geometry is not that of schemas because that does not take into account time. In schemas there is a chiasm between the ordering of space and the ordering of time that is different from both of them. That is why Kant tied the schemas to time, to make that point in a world determined as static relations by Descartes marriage of Geometry and Algebra. As Kant says[2] every schema appears in time as 1.) time-series, 2.) time-content, 3.) time-order, 4.) scope of time. In other words there is a repetition of the schema as a series on the one hand and a representation of the schema as a scope on the other hand. Each

schema has its own content and order. The content are the lower level schema at the lower emergent levels from which ever schema you are considering at the moment. The order is the unique order that goes beyond the supervenience to give an emergent excess at that level over the lower levels. The relation between the scales of the schemas is dimensional. So Kant's definition of the schema brings representation, and repetition together with dimensionality to produce a picture of the temporality of the schema as opposed to the pure geometrical and algebraic quality of the dimensionality. It is in the order that the schema is emergent. Its content are lower level schemas. That order is brought out by the relation between representation and repetition that Deleuze discusses in <u>Difference and Repetition</u>. Once we realize along with Michael Taussig that Mimesis occurs between each aspect of representation and repetition at each dimensional level within the schemas then we begin to understand the unique infrastructure of the schemas themselves and how they are elaborated. In this work we will explore that insight into the inner organization of the schemas as distinct from dimensional organization that generates the differences between the schemas. And we will attempt to divine its implications for other fields and disciplines particularly Systems Engineering. General Schemas Theory itself is an emergent new discipline and its is difficult to say what it's impact might be. But it is worth our time to attempt to lay these foundations because the future of systems theory and systems engineering is at stake in this work. If we are not successful in laying these foundations for these disciplines then the term "system" will lose its meaning and the engineering of emergent systems will not be able to cope with the ever increasing complexity of real world systems with a single schema for use in design which is not robust enough to contain all the complexity that exists in our brave new world.

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[2] http://www-philosophy.ucdavis.edu/kant/SCHEMA.HTM