RESEARCH PROPOSAL

for PhD

by

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STUDENT'S DECLARATION

I declare that this Research Proposal does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge it does not contain any materials previously published or written by another person except where due reference is made in the text.

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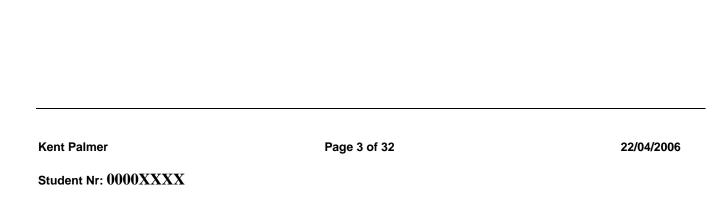Previous works of author at **http://archonic.net**

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SECTION 1 -

STATEMENT OF THE TOPIC AND RATIONALE FOR THE RESEARCH

BACKGROUND

In many instances Systems Engineering is dependent on ad hoc methods. As a discipline it is in search of its foundations with respect to its methods and approaches, and one of those possible foundations is Systems Theory. Systems Theory is an academic discipline that examines the *system schema* as it appears in many different disciplines. Systems Engineering also uses this *schema* as a means of understanding the design, construction, and testing of products. Systems Theory is also in search of its own foundations in philosophy. After I finished my Ph.D. in Sociology at the London School of Economics, I attempted to expand on George Klir's *General Systems Theory* by using Klir's Architecture of Systems Problem Solving[1] as a basis. This endeavor culminated in producing an inverse *Meta-systems Theory*, which served to complement the structural systems theory of George Klir. I collected these ideas in an electronic book entitled Wild Software Meta-systems[2], which is an unpublished book of essays on Software and Systems Design Methods. This work applies the kinds of Being (as they are articulated in Continental Philosophy) to Software and Systems Engineering. It also prompted the creation of a language of system design that is based on a model of the interaction of various viewpoints and their corresponding minimal methods. Next I returned to my previous interest in *Ontology* and the *Emergence of new things in the world* by an analysis of the structure of the

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[1] Plenum Press ,New York, 1985

[2] http://archonic.net/wsms.htm

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Western worldview, which appeared as a second unpublished electronic book called <u>The Fragmentation of Being and the Path Beyond the Void</u>[3]. This book included an partial commentary on Plato's Laws, as well as a preliminary inquiry into *special systems theory* using the *cities* that appear in Plato's laws as a basis of comparison. A third unpublished electronic book called <u>Reflexive Autopoietic Systems Theory</u>[4] was written as an attempt to develop a more formal definition of the Special Systems; and in that process, the *Emergent Meta-system* was discovered. I presented this research at ISSS[5] and INCOSE[6] conferences.

At this point I decided to apply to the SEEC Ph.D. program in order to expand my study of both *Special Systems Theory* and *Meta Systems Theory* in order to pursue a more complete understanding of the relationship between normal systems, special systems and meta-systems. These theories are very complex and have far reaching implications for our understanding of the nature of systems.

When I started my Ph.D. program at SEEC I decided to try to write down everything I knew about the schemas, which are the object of General Schemas Theory. The results of this work can be seen in a series of working papers called the *Anti-thesis* at http://holonomic.info. What I realized from this study and review, was that I really needed to pinpoint what a schema is, given the varied uses of the term in the literature. It turned out that even though I had previously developed a fairly detailed model of the

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[3] http://archonic.net/fbpath.htm

[4] http://archonic.net/refauto2.htm

[5] http://isss.org

[6] http://incose.org

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Special and Meta-systems, this work needed to be grounded by a study of the nature of the schemas themselves *in the context of other schemas* such as: Pluriverse, Kosmos, World, Domain, Meta-system, System, Form, Pattern, Facet and Monad. I call this set of schemas the Ontological Hierarchy, as opposed to the Ontic Hierarchy, which is composed of the emergent levels of physus such as: string, quark, particle, atom, molecule, cell, organ, organism, social, and gaia. The working papers that I wrote after starting my research explored each schema in turn and attempted to give examples of each schema as well as studying the implications of their relations to each other. Since writing those working papers I have been engaged in attempting to find various works on schemas theory and I have attempted to understand the various uses of the term in various academic contexts. It happened that my proposed dissertation title, which emphasized *foundations*, was apropos, because, by having the *formal* part of the theory fairly well defined, I discovered the need to define the *nature* of the schema as it is grounded in the philosophical and scientific tradition.

I now see my research unfolding through the process of writing four series of working papers, one of which is already written. This first one explored the different schemas within General Schemas Theory. It is called the *Anti-thesis*. The *Anti-thesis* attempts to capture and develop everything I knew or could figure out about the nature of schemas and their relationships to each other. In the process of writing the *Anti-thesis* I learned a great deal about the nature of the hierarchy of schemas by bringing together material that had not been analyzed or synthesized before by me (or by any one else) to my knowledge. As part of my research into schemas, I scanned literature for references to schemas and eventually found that there are indeed, many references to the subject. A particularly good study is that of

Umberto Eco called <u>Kant and the Platypus</u>[7]. Also, as part of my research to date, I have studied the philosophy of Deleuze[8], which has been useful as a basis for better understanding the relation between *difference* and *sameness* when referring to the definition of the schema. My reading has been oscillating between the work of Deleuze and his interpreters, as well as works by other authors on the nature of the schema. I envisage producing another series of working papers about the foundations of the schema, i.e. a genealogy of the concept of the schema as a topic in the Western Scientific and Philosophical tradition. This will deal with the schema's various forms, from Plato to Kant, to Heidegger, and beyond, including a review of recent work involving schemas and systems theory in cognitive science and neuroscience. At this point four papers covering the explorations of the foundations of schemas theory are available at http://holonomic.info.

As the dialectical opposite of the *Anti-thesis* on schemas in general, I also envisage producing a set of working papers on the Special Systems called the *Thesis*, and then a fourth set of working papers called the *Synthesis* on the Emergent Meta-system. I see the dissertation evolving out of what I will learn by writing these four series of working papers. Since I do not know what discoveries that I will make along the way, it is difficult to articulate the exact form and content of the final thesis. I normally learn things through the process of research and discovery by writing my working papers and it is difficult to predict the outcome of the research. However, the area in which I am most lacking in knowledge, concerns the *philosophical foundations* of the schema concept in the Western tradition, although I feel

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[7] <u>Kant and the Platypus: Essays on Language and Cognition;</u> (Harvest Books, 2000)

[8] <u>Difference and Repetition</u>; (Columbia University Press, 1995)

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quite confident of other aspects of the research horizon that I have previously explored. My intention is to explore what is known about the schemas and to synthesize that work and base it on modern continental philosophy. I then plan to rework the theories of *Special Systems* and the *Meta-System* on the basis of this newly laid foundation of *General Schemas Theory* as it relates to the Western scientific and philosophical tradition. With regard to *Special Systems Theory* and *Emergent Meta-Systems* I intend to reinterpret the mathematics on which they are based in order to formulate a more rigorous presentation. I also plan to incorporate what I learn into the redesign of my Systems Design Language (ISEM) so that it may become a useful tool for Systems Engineers. My research on these applications will hopefully bring new insights to the field of Systems Engineering Process Models[9] as well. My current work as a Systems Engineer mainly entails working toward CMMI level three in Systems Engineering and CMMI level five in software engineering for my company. I plan to develop a design language that will apply to both *Systems Design* and *Systems Processes*. But, both the work on the Systems Architectural Design Language[10] and the Theory of Technical Work Processes is meant to be a derivative or off-shoot from the main research program represented by the four series of working papers outlined above and is not to be considered part of the Dissertation proper.

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[9] See "Advanced Process Architectures" Briefing at http://archonic.net/advanced.htm

[10] called Integral Systems Engineering Methodology (ISEM)

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SIGNIFICANCE OF THE PROBLEM

Systems Engineering has developed ad hoc methods that were defined in industry though practice and application, although they had little theoretical basis. Software Engineering has developed design methods and processes, which are now being imported by systems designers for the purpose of solving problems in Systems Engineering. The question is: Are there methods that are particular to Systems Engineering which are necessary beyond those applied to Software Engineering? The Software methods themselves are in flux and are proliferating with little theoretical justification. The emphasis in both disciplines is on practical applications in Real-Time system design and production. In Software Engineering, there are foundations in computer science to build upon, while in Systems Engineering there is no such grounding academic discipline that supplies it with theory. I believe that Systems Theory should become the grounding academic discipline of Systems Engineering. Yet Systems Theory is limited because it only directs its inquiry toward one schema out of the Ontological Hierarchy of the schemas named above. Thus I think that Systems Engineering and Systems Theory should be expanded to encompass *all* the schemas and their relationships to each other as a basis for design, production, and the testing of products. Schemas theory has not been previously defined with any rigor except in the development of models of individual schemas, but *the interaction between schema models* has not been a subject of research.

Another key problem is that both Systems Theory and Systems Engineering have not taken into account the developments of Philosophy and Mathematics, or other disciplines such as Cognitive Science. My intention is to present a theory which includes developments in metaphysics and ontology, as well as various aspects of mathematics, in order to create a theory that will be on the cutting edge of

the development of our broader Philosophical and Scientific tradition. In a world which is increasingly complex, and where systems and their applications are becoming more and more complex all the time, it is necessary to increase the robustness, coherence, and integrity of Systems Engineering and Systems Theory. Systems Engineering is a nascent discipline which is just beginning to differentiate itself from other previously defined disciplines such as Software Engineering. For example, there is no Systems Engineering Institute such as the one for Software Engineering at the Carnegie Mellon University. Engineers are not trained in an interdisciplinary fashion, and tend to be too involved in their productive work to keep up on what is happening throughout the tradition. I believe that dissertations in Systems Engineering should provide the discipline of Systems Engineering with theoretical and practical perspectives that integrate with other disciplines that might be useful for further development.

As part of my long standing research program I have taken the sophisticated form of *General Systems Theory* developed by George Klir as my basis; from that, I developed a *Meta-systems Theory*, and then went on to develop a *Special Systems Theory*. Now my goal is to look at the foundations of these new systems theories in the context of all the schemas, and to attempt to understand the implications of the philosophical, mathematical, cognitive, and social grounds of the schemas, which include, systems, special systems and meta-systems. The significance of the problem is that Systems Engineering needs to develop foundational theories that will guide practical application and draw on different parts of the Scientific and Philosophical tradition. This will produce a Systems Engineering discipline that will stand up to the challenges of the twenty-first century.

RESEARCH TOPIC

The research topic concerns the foundations of the Special Systems, their relations to each other, and the normal system within the Emergent Meta-system. The emphasis here is on foundations, i.e. the question of how the special systems are embedded in the ontological hierarchy of general schemas and the meaning of the schema itself from a philosophical point of view.

My previous research topic for my first dissertation was on the nature of emergence and how new things come into existence in relation to scientific theorizing. The title of that dissertation at the London School of Economics was <u>The Structure of Theoretical Systems in Relation to Emergence</u> (1982). Since starting my new research project I have discovered that the schemas are the inverse viewpoint to that of emergence. When we say a new thing comes into existence, that thing appears first in the form of a *filling out* of a schema. Thus, schemas contain what emerges. So, I am now exploring the inverse of the problem that I dealt with in my first dissertation in which I discovered the hierarchy of the kinds of Being and the fact that emergent events need to transition all four kinds of Being in order for an emergent entity to appear in the world.

Research Problem

The fundamental problem this research will attempt to answer is:

What is the nature of the schema from a philosophical point of view, and how do the special systems arise out of the hierarchy of schemas, and how do the schemas interact and combine to produce the emergent meta-system?

Open Questions and Related Topics:

1. What is the relation of the System to its inverse, the Meta-system?

2. How do Systems and Meta-systems relate to the Ontological Hierarchy of schemas?

3. What is the interaction of the Schemas in General Schemas Theory?

4. How do the Special Systems arise and what is the significance of this emergence in relation to Systems and Meta-Systems?

5. What is the basis of the arising of the Emergent Meta-system as a result of the interaction of special systems and normal systems that produce meta-systems?

6. What is the nature of the geometrical or mathematical schema in relation to other uses of the term in

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the philosophical and scientific tradition?

7. How are Schemas socially constructed and invented within the context of a reflexive sociological theory?

8. What is the relation of the ontological hierarchy of the Schemas to the ontic hierarchy of phenomena discovered as physus by science?

9. What is the history of the Schema within the Western tradition in Plato's forms, Aristotle's categories, Kant's categories and temporal schemas, as well as modern cognitive science and philosophy?

10. What is the role of *difference* in relation to the Schema's *sameness* as expressed in the philosophy of Deleuze and other Neo-Postmodern Philosophers?

11. What is the appropriate genealogy of the schema within the Western Tradition?

11.   How do schemas function in science and across disciplines?

11.   What are the practical implications of schemas?

THESIS TITLE

The proposed thesis title is "**The Foundations of Emergent Meta-systems Theory and Practice**".

Explanation of the Title: *Foundations* refers to the genealogy of the mathematical or geometrical schema within the Western worldview. *Emergent-Meta-systems* are the combination of Special and

Normal systems into a single configuration. Special Systems are composed of the Dissipative Ordering Special System, Autopoietic Symbiotic Special System, and Reflexive Social Special System which are defined in terms of Hyper-complex algebras and other anomalous mathematical and physical formations. All of these types of systems are examples of one particular sort of schema. There are other kinds of Schemas such as Pattern, Form, and Meta-system and these are the objects of the General Schemas Theory. General Schemas theory is an extension of the General Systems Theory as proposed by George Klir in Architecture of Systems Problem Solving. By extending Systems Theory to a General Schemas Theory, we lay the foundations for Systems Engineering more broadly. Systems theory should give way to '*Schemas Theory*' and Systems Engineering should give way to '*Schemas Engineering.*' Once we understand this advanced Schemas Theory, we can consider its implications for the Systems Engineering practice, especially in relation to design theory, and in relation to the products and processes of Systems Engineering and other Engineering disciplines.

SECTION 2 –

RESEARCH APPROACHES

My research will be qualitative in approach and conducted in part-time external mode as I continue to engage in the practice of Systems Engineering and Process Engineering as an employee of an aerospace firm. In effect, the schema will be studied and analyzed as a philosophical and scientific trope in relation to emergence. When phenomena emerges it takes on the form of one of the schemas before it is distinguished in terms of *kind* or in terms of its peculiarities or in terms of significance.

The approaches to address each of the sub-problems are proposed below.

Sub-Problem 1 – The nature of the Schema within the Western Philosophical and Scientific Tradition.

I plan to look at contemporary philosophy, especially that of Deleuze, for guidance on how to understand the problematic of *sameness* and *difference* in our philosophical tradition. I began by reading Umberto Eco's Kant and the Platypus which was a review of the literature on the schema. I then read Conceptual Spaces[11] by Peter Gärdenfors which sharpened these distinctions and placed the problem in an artificial intelligence and cognitive science perspective. Recently I have been reading about related discoveries in neurological science. I have also read a study of Plato's Theory of Forms[12] and plan to read studies of Aristotle's works as well in order to attempt to ground the theory of schemas as deeply in the Western Philosophical and Scientific Tradition as possible. This is an open problem for

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[11] http://www.lucs.lu.se/People/Peter.Gardenfors/Conceptual.Spaces/ (MIT, 2000)

[12] Silverman, Allan; The Dialectic of Essence: A Study of Plato's Metaphysics, (Princeton Univ Pr, 2003)

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me because although I have developed a theory describing the ontological hierarchy of the schemas and I am still in the process of developing a clear and concise definition of the schema since it has so many different manifestations in the tradition. Basically this will be a review of the literature on the schemas which I consider necessary because such a review will help to ground my use of the term *schema* in the previous conceptualizations about the nature of the schema. This work will appear as a series of working papers called *The Foundations* and is intended to serve as a genealogy of the use of the term schema.

Sub-Problem 2 – The structure of the Ontological Hierarchy of the Schemas.

I have written a series of working papers that deals with each schema. They are available at http://holonomic.info. I refer to this series as the *Anti-thesis*, and in these works I brought to bear formalisms that were pertinent to the definition of the different schemas. The papers were oriented toward trying to understand the overall structure of the schemas as a group of bases for representation. More work needs to be done on understanding the overall structure of the hierarchy of schemas as a whole and how individual schemas fit into that hierarchy.

Sub-Problem 3 – How does the projection of Schemas occur within society?

I define a system as a "social gestalt", which calls for a consideration of the reflexive social field within which the schema projection occurs. A paper titled On the Possibility of Grounding Reflexive

<u>Sociology</u> that I presented at the Social Theory Conference of 2003, reflects aspects of the relationship between the schema and society.

<u>Sub-Problem 4 – How do the Schemas, as expressions of Logos, interact with the Ontic Hierarchy of Emergent Phenomenal levels discovered by Science as an expression of Physus?</u>

In this area I am hoping to analyze the definition and the place of the schema in relation to theory, as well as to analyze how schemas arise as projections in certain scientific theories. I am planning to look for classic examples of this which will show how different schemas can be projected on the same phenomena but will produce different perspectives of those phenomena.

<u>Sub-Problem 5 – How do the Schemas interact with the Social and Individual Emergent Hierarchies?</u>

This sub-problem has to do with how the schemas relate to *emergence* which was the subject of my previous dissertation. All emergent events concretize themselves as schemas within the world, thus schemas are the reification of emergent events. To my knowledge, no one has ever studied the relation between schemas and emergent events before. The social and individual hierarchies are the ways in which emergent events are channeled into the world and handled as information and knowledge. I would like to look for instances in the interaction of theory and experiment where new phenomena appear and, in the process, I hope to understand how it is schematized within the scientific horizon.

Sub-Problem 6 – How do the Special Systems unfold from the General Schemas?

In previous works I have established many different mathematical analogies concerning the structure of Special Systems and their relation to Systems and Meta-systems. However, using mathematics to under gird the theory of Special Systems is in its infancy and needs further development. I plan to study and to try to understand how these mathematical systems actually work as a form of under girding for the Special Systems theory. I would also like to search for further examples of the type of anomalous mathematical objects that tend to lend support for the distinctions made in Special Systems Theory. This research, which I will refer to as the *Thesis*, will also appear in a series of working papers on the *nature* of the Special Systems as well as *how* they will unfold from the Schemas' emergent hierarchy.

Sub-Problem 7 --   How does the Emergent Meta-system dialectically arise from the Normal and Special Systems taken together?

One of the key problems that I hope to confront is the question of how the Emergent Meta-system can exist as a special kind of mathematical object. I hypothesize that beyond unicity, duality, and triality, there is a new mathematical relationship which is called *Quadrality*. This new mathematical relationship is manifest in the Tits Magic Square that connects Jordan algebras to Lie algebras. I plan to continue to research the nature of these forms of mathematics and how they ground the Emergent Meta-system. My research will consist of examining category theory, the theory of Lie and Jordan Algebras, and works that specifically explore the Tits magic square. This work will appear as a series of working papers that I will call the *Synthesis*.

Sub-Problem 8 – What is beyond the Emergent Meta-system?

Although research and information on Sedenion and 32-nion algebras is limited, another horizon of research that would further expand my thesis concerns the nature of algebras beyond the Emergent Meta-system as it is supported by the Hyper-complex division algebras.

Sub-Problem 9 – How are Logic, Schemas and Mathematical Categories Interrelated?

This topic is explored in my paper on *Vajra Logic and Mathematical Meta-models for Meta-systems Engineering[13]*. In this paper I presented Model Theory as a way of relating Logic and Mathematical Categories. When we consider the schemas, we see that there is a representational relation of the schemas to mathematical categories, as well as philosophical categories, and logic. We need to reconceptualize logic and mathematical categories in light of their relation to the schemas. In mathematical categories we need to recognize the duality of Mass and Set. In Model Theory we need to recognize the relation between all four aspects of Being as they appear in the Vajra Logics and in the Matrix Logic[14] of August Stern. The Diamond[15] and Delta Logics[16] of N. Hellerstein based on G.

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[13] See http://archonic.net/incose2002/vl01A162.htm

[14] (Elsevier Science Ltd, 1988)

[15] Hellerstein, N. Diamond: A Paradox Logic (World Scientific Pub Co, 1997)

[16] Hellerstein, N. Delta: A Paradox Logic (World Scientific Pub Co, 1998)

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Spencer-Brown's <u>Laws of Form</u>[17], and the Syllogistic and Pervasion Logics also need to be studied in this context.

RESEARCH SCHEDULE

The research agenda proposed here is very ambitious and exactly how much of it I will be able to accomplish depends on how well things go in terms of the realizations and insights that occur along the way. My basic plan is to spend four years on the project. The first year will be devoted to *foundations* because that is the part I know the least about. At the end of the first year I intend to write the second series of working papers on the *Foundations of Schemas Theory* that will treat the genealogy of the term schema within the philosophical and scientific tradition. Once the foundations have been more or less secured, I then intend to revisit previous research on the relation of Special Systems to the General Schemas Hierarchy and I plan to write the *Thesis*, which will be a series of working papers on how the Special Schemas unfold from the normal schemas. I hope to do this at the end of the second year.

After exploring the unfolding of the Special Systems, I will turn my attention to the emergent meta-systems in a fourth set of working papers called the *Synthesis*. The center of this work will be the concept of *quadrality*, which is a concept that occurred to me after I was accepted to the program, and I plan to make that concept the center piece of my research project. Hopefully these working papers will be written by the end of the third year. Finally I intend to take this expanded material and summarize it in the dissertation proper which I will write in the fourth year. Along the way I hope to write at least

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[17] (Cognizer Co, 1994)

one conference paper per year. This year I have written a paper on Reflexive Sociology[18] which I presented at the Social Theory Conference. I am hoping to summarize my thoughts about General Schemas Theory in an article for the SE Research Conference in Los Angeles in 2004[19]. I have also submitted an abstract to a Software and Systems Conference sponsored by Raytheon Corporation, which will be held in 2004. This abstract is titled *The Frontiers of Systems Architectural Design Methodologies*.

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[18] http://archonic.net/rst.htm

[19] An abstract has been submitted but acceptance has not been received yet.

SECTION 3 -

TRIAL TABLE OF CONTENTS

APPENDIX 1 – On the Integral Systems Engineering Method – a Design language using Schemas.

APPENDIX 2 – Implications for Process and Product Development in Systems Engineering

NOTE: DEPENDING ON THE PROGRESS OF RESEARCH THIS TRIAL TABLE OF CONTENTS MAY UNDERGO DRASTIC CHANGE OVER THE NEXT FOUR YEARS.

SECTION 4 –

LITERATURE REVIEW

The initial literature review has focused on the *foundations* as related to Schemas Theory in the proposed thesis title, *The Foundations of Emergent Meta-systems Theory and Practice*. The key elements are:

12. The use of the term Schema in the literature

13. The identification of the concept of Schema

14. The relation to the concepts of *difference* in the philosophy of Deleuze

15. The relation of schemas to the theory of the Forms of Plato and to the Theory of Categories of Aristotle

16. Kant and Heidegger's use of the term schema.

17. Related theories of cognitive science, neuroscience, and artificial intelligence.

As might be expected, this research into the nature of schemas has led to some unexpected results and my ideas on the subject are still in flux. I am hoping to have some definitive conclusions by the end of my second series of working papers. Just exploring the nature of the schemas in the tradition could amount to a thesis in itself, so at some point I need to decide just how deeply to go into these foundations. Four papers have been written in this new series and they are available at http://holonomic.info.

During the first ten months of my investigation I was lucky enough to unearth several research horizons that may prove fruitful beyond the exploration of the background of schemas theory:

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12. Weak Measurement -- Yakir Aharonov[20]

13. ·Link Theory[21] – Thomas Etter[22]

14. Negative and Imaginary Probability Theory – Saul Youssef[23]

15. Time Series or Measure Chain Calculus[24] – Stefan Hilger [25]

16. Negative Dimensionality[26] – No known source[27]

0. Pascal Simplicies[28] – Eric Rowland[29]

I have been exploring these various theories, and I am attempting to see if they will present any new approaches to the operationalization of Autopoietic Theory. I have written a paper called *Reflexive Autopoiesis and Weak Measures* that gives the first results of these explorations and attempts to use Weak Measurement Theory as a basis for reconceptualizing the non-computable nature of Autopoietic

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[20] http://boson.physics.sc.edu/~quantum/People/Yakir_Aharonov/yakir_aharonov.html

[21] http://Boundary.org

[22] http://www.boundaryinstitute.org/theoretical.htm

[23] http://physics.bu.edu/~youssef/

[24] http://mathsrv.ku-eichstaett.de/MGF/homes/didphy/measure.htm; See S. Hilger, Analysis on measure chains -- a unified approach to discrete and continuous calculus, Results Math. 18 (1990), 18-56; S. Hilger, Differential and difference calculus -- unified!, Nonlinear Anal. TMA 30 (1997), 2683-2694.

[25] http://mathsrv.ku-eichstaett.de/MGF/homes/didphy/index.htm

[26] www.geekspiff.com/academics/eee511/hw1/hw1.doc Jason Harris mentions the volume of a hypersphere of negative dimension one.

[27] See S.H. Schanuel, "Negative sets have Euler characteristic and dimension", Category Theory, Proceedings, Como 379-385, 1990; See also http://mathquest.com/discuss/sci.math/a/m/101851/101855 and 101857

[28] http://people.ucsc.edu/~erowland/pascal.html

[29] http://people.ucsc.edu/~erowland/

Systems. This field of study led to an interest in the *Link Theory* of Thomas Etter and the *Negative and Imaginary Probability Theory* as it is applied to the Quantum Mechanics of Youssef. This research in turn led to the consideration of the possibility of negative dimensions and then to the Role of the Pascal Simplicies in the definition of the schemas.

Another research horizon that I have explored in this first year is the relation of Schemas Theory to Reflexive Sociology. Schemas are socially projected "forms" that underlie the organization of experience, which creates places within spacetime for phenomena to appear. This means that the grounding of schemas theory in Reflexive Sociology is a necessary horizon to explore. This exploration resulted in a paper *On the Possibility of Grounding Reflexive Sociology* which I presented at the socialtheory.org conference in April 2003.

SECTION 5 -
REFERENCES

When I received my first PhD in Sociology from L.S.E. in 1982 I finished with 835 entries in a bibliography that I started when I began my research in England in 1973. When I returned to the USA from England my bibliography stood at 856 entries. When I got my first job working in Aerospace as a Systems Engineer my bibliography had grown to 959 entries. When I moved from Kansas City to Southern California in 1983, my bibliography had 1036 entries. When I got my first job as a Systems Engineer my bibliography expanded to 1177 entries. When I got my first job as a Technologist and Process Engineer in Software my bibliography had 1185 entries. After working for Boeing for 14 years I moved to Raytheon to do Process Engineering for Systems Engineers using CMMI, at this point in

time my bibliography stood at 2091 entries. When I started my second Ph.D. my bibliography stood at 2091 entries. Today my bibliography stands at 2134 entries. Sometime ago I decided to record only library books and I stopped adding entries for books that I owned or articles taken off the Web. However, I intend to begin keeping more accurate records from this point forward. I still have quite a few articles which I read this year to add to my bibliography. My bibliography is available on request. But, unfortunately it is handwritten so it is difficult to include here. My bibliography is an eclectic collection of a wide range of topics and themes and not only supports my current research project as its source, but it is also a sign of my indebtedness to the Western Philosophical, Scientific and Systems Theory tradition of which I am a product.

Instead of citing specific references I will talk about themes that I intend to continue to explore.

12. Systems Engineering as a practical discipline

13. Systems Theory as an academic discipline

14. Philosophy of Difference and Sameness (i.e. logocentrism, and post-modernism)

15. Emergence and Supervenience

16. Ontology and Existentialism

17. Phenomenology

18. Category Theory, Algebra, Topology, and other Mathematical Categories relevant to defining the Special Systems.

19. Genealogy of the term Schema in the Philosophical and Scientific tradition.

20. Quantum Mechanics at the Macro Level as well as the Micro level

21. Computational Theory

22. Software Engineering Methods including UML

23. Technical Work Process Engineering

24. Systems Architectural Design

25. Cognitive Science

0. Theory of Concepts and Metaphors

0. Design Language Design

0. Deviant Logics and Model Theory

There are vast literatures associated with each of these themes. I am looking for the most succinct

references within those literatures that will relate to my topic and shed light on it.

APPENDIX 1

GLOSSARY

Autopoietic Special System – Self-producing or self-organizing system as defined by H. Maturana and

    F. Varela.

Dissipative Special System – What I. Prigogine calls a "dissipative structure" which is a neg-entropic

    spreading of an ordering regime with a dynamic boundary. Two dissipative systems compose an

    autopoietic system.

Emergent Meta-system – The combination of a normal system with the three special systems to

    produce a peculiar formation in which there is an unfolding of a system into each stage of the

special systems until the threshold of the meta-system is reached and then the cycle starts over again. It is believed that this formation is associated with a mathematical property which is hither to unidentified in mathematics called Quadrality which is in the series Unicity, Dualty, Triality, and Quadality. It is also believed that this formation is related to Tits Magic Square which is made up of Lie and Jordan Algebras.

Meta-System – The inverse of the System, which can be defined as the environment, context, situation, ecosystem, milieu, or other words that suggest either what lies within or outside the system boundary. When it lies within we are using the sub-system as our reference point. Systems can be nested into sub-system, system, and super-system hierarchy and the meta-system is what lies between these system schema thresholds at various levels of abstraction. An image of the Meta-system is the Universal Turing machine.

Reflexive Special System – The social system made up of at least two autopoietic systems.

Schema – This term has many meanings. We concentrate on the meaning of the term that coincides with Plato's geometrical forms and Kant's use of the term schema as the operationalization of his categories with respect to time. Umberto Eco identifies geometrical or mathematical schemas as being different from other uses of the term.

System – A social gestalt. Systems like all schemas are projections of order onto the spacetime plenum identified with specific objects of perception. An image of the System is the Turing Machine.

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