

**The Social Brain:
Stratification Theory as Applied to Neural Architecture enabling
a
Brain-like function for Social Networks¹**

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¹ see also <http://www.educationworlds.com/pdf/immersiveClassroom.pdf>

² This paper presentation was assisted through a gift provided by the House of Tutors, Austin Texas.

Neural and Immune Architecture

Existing open source social network software will be soon extended so as to support new types of emergent social processes. Two areas of interest are education and health care. The extension we have been working on creates several types of knowledge encoding, following neural architecture and principles in theoretical immunology.

We have outlined a neural architecture³ for cognitive support and a digital immune system. The immune system provides a new level of informational security assurance. These two systems are designed to work as “social brain”. The concept of a social brain was suggested in the classical book by Minsky. Minsky’s “*Society of Mind*”⁴. is part of the classical and neural network research literature⁵. In *Society of Mind*, Minsky proposed that community intelligence is a natural outcome of an increase in connective-ness related to modern social realities.

Given these advances, we envision a communications medium that enhances individual perception. Prueitt’s early (1988) work on Boolean switching nets⁶ and planar rotators⁷ provides a base for understanding emergent phenomenon. These formalisms are foundational and motivational, but are far more complicated than the formalism that we propose.

A number of issues are addressable. These include jurisprudence, issues of ownership, verification of underlying theory, and concerns about time to technical implementation. The issue of ownership is critical. We are determined to see digitally based social-capacity not

³ Levine, D. & Prueitt, P.S. (1989.) Modeling Some Effects of Frontal Lobe Damage - Novelty and Preservation, *Neural Networks*, 2, 103-116.

⁴ [The Society of Mind](#), Simon and Schuster, 1987. The first comprehensive description of the Society of Mind theory of intellectual structure and development. See also *The Society of Mind (CD-ROM version)*, Voyager, 1996.

⁵ Wiki: Marvin Minsky: http://en.wikipedia.org/wiki/Marvin_Minsky

⁶ Eisenfeld, J. & Prueitt, P.S. (1988.) Systemic Approach to Modeling Immune Response. Proc. Santa Fe Institute on Theoretical Immunology. (A. Perelson, ed.) Addison-Wesley, Reading, Massachusetts.

⁷ J. Kowalski; A. Ansari; P. Prueitt; R. Dawes and G. Gross (1988.) On Synchronization and Phase Locking in Strongly Coupled Systems of Planar Rotators. *Complex Systems* 2, 441-462.

tioned to third party ownership of the software. Prueitt in five papers⁸ on notation published a body of foundational work, in stratified computing, and has proposed implemented this work as open source code. Implementation will follow notation and result in a code base. Prueitt has declared this property to be public in nature using publication into the public domain as the means to achieve this status.

We seek to implement a system enabling brain and immune system like function for social networks. To the degree that ownership is necessary we propose that the federal states provide this service. The ownership is to be maintained by state chartered corporations, registered as “within state boundaries only state corporations”. This restriction is so that the state’s right to assert un-enumerated Constitutional rights over federal enumerated rights is not contestable.

Legal Issues

Within state boundaries status exempts state chartered corporations from federal actions arising from parts of the U S Constitution related in part to the Interstate Commerce Clause. However, this exempt status is destroyed if there is any essential outsourcing of service fulfillment to any person or corporate individual living in two states. The Interstate Commerce clause of the U S Constitutional is then germane. Social networks with brain and immune-like process infrastructure are a new type of corporations. We are recommending within state based corporation be so equipped so as to support pure public sector functions related to health care and education. There are several advantages, one being that the perplexing issues related to transparency and protection of private information are resolvable.

For example a state chartered private corporation might have no outsourcing to any entity involved in interstate commerce. These state chartered corporations are defined to monitor the health of the citizens of that state or to provide other forms of public trust. To

⁸ Prueitt, Paul Stephen (published on the web – March 2011). Five Papers on Notation. Posted at www.reversetwitter.com

achieve this purpose we also propose that each of these social network infrastructures have a highly secure computing backplate⁹ as well as a digital immune system¹⁰.

The American Education Bridge¹¹ proposes two of these state based corporations in each state of the federal union, with initial federal investment founding one hundred Second School™ community centers. The Bridge's founding group has suggested a fifty state project be initially funded by a grant from the U.S. Department of Education. However, the development of a stimulus for a grass roots movement is only slightly less than one half of the first phase effort. Sixty million dollars is to be spent on creating a new infrastructure for 3D Internet servers with digital private interiors.

What is Possible?

The private interior is simply a set of data compression and a set of encoding mechanisms that has two properties. The first property produces a type of accountability related to data access called instrumented super distribution¹². A fractal like encoding allows data to reside in one place, or a small number of places, and for these places to communicate with each other. The fractal compression uses a set of rules that like genes express as an object. The compression allows data to not exist while in transit. Like a seed that grows a tree. The backplate is the soil that the tree grows in. What exists is a uniquely encrypted set of rules that express only in specific types of soil. What is sent through the Internet is 1/1000 or more the size of the full-uncompressed object. So seeds are small and cannot be grown except in special parts of the computing backplate and also with notification. If one of my seeds is grown then my immune system must be identified as part of the growing process.

⁹ Prueitt, Paul (2009) - "The Service Engine: Structured Communication using Modern Service Technologies" SOA Magazine, <http://www.soamag.com/I30/0709-1.asp>

¹⁰ Eisenfeld, J. & Prueitt, P.S. (1988.) Systemic Approach to Modeling Immune Response. Proc. Santa Fe Institute on Theoretical Immunology. (A. Perelson, ed.) Addison-Wesley, Reading, Massachusetts.

¹¹ Prueitt, Paul Stephen (published on the web in 2010). The American Education Bridge, a Proposal of the American President. (455 pages) www.secondSchool.net/bridge.pdf

¹² Cox Brad (1996) SuperDistribution Objects as Property on the Electronic Frontier Addison-Wesley

Our compression is not a standard fractal, but rather is a “stratified service oriented architecture”¹³ having a small set of primitives, or structural atoms, which then may be composed. The computing backplate, invented by Prueitt in 2009, instruments all gene expression and forces phenotypes to express only if the genotypes involved receive notification. Private information can only exist in a computing backplate based social network if the owner of the information is notified of each use. The notification packets are extremely small and propagation in ways similar to text in text chats. These exchanges also require authentication.

The super distribution properties of a computing backplate create an interesting relationship between digital genealogy and digital phenotype, with each member of a category “having a real time communication link” to every other member of a category. The digital immune system manages the set of genes that define the individual, be this the individual human being’s digital self or social or business corporations. A recognition system is provided, based on Prueitt’s work in cyber security¹⁴, having the ability to see when or if information is exfiltrated from an interior into the environment. A derivative of the Mill’s logic^{15 16} developed by Soviet era applied semioticians is used to manage several aspects of the gene pool and categorization, and recognition.

Obviously there are many ramifications, including legal and moral. However, the work we are proposing takes advantage of natural realities and thus must be seen as anticipatory to how things will be in the near future. For example, a "memory" system and a set of "anticipatory" mechanisms might be encoded as "stratified" ontological models, of the type now designed for national or business

¹³ Prueitt, Paul S. (1995b) An Implementing Methodology for Computational Intelligence. In the Proceedings of First International Conference on Computational Intelligence and Neuroscience. IEEE

¹⁴ Prueitt, Paul and Peter Stephenson. "Towards a Theory of Cyber Attack Mechanics." First IFIP 11.9 Digital Forensics Conference. Orlando, FL, 2005.

¹⁵ Prueitt, P. (1997). Quasi Axiomatic Theory, represented in the simplest form as a Voting Procedure. Presented in Moscow at a conference held at VINITI, and published in All Russian Workshop in Applied Semiotics, Moscow, Russia. (Translated into Russian and published in VINITI Conference Proceedings.)

¹⁶ Prueitt, P. (1998). An Interpretation of the Logic of J. S. Mill, in IEEE Joint Conference on the Science and Technology of Intelligent Systems, Sept. 1998, NIST.

intelligence. The system might then be used as a cognitive enhancement for an individual living human being, or for a social or economic corporation.

Stratified computed processes work in ways similar to how the neural and immune systems functions^{17 18}. A back plate based Digital Immune System was designed, (Prueitt 1999) and tested (2009-2010). The general principles are based on work by individuals who are in the theoretical immunological community; including Stephanie Forester at UNNM. The back plate based work was not publicly released until recently. We see this work as being based on natural science and thus public domain in nature. In the public domain, the principles are undergoing peer review.

To understand stratification theory one must see first principles of current science. One must also see that some of the accepted principles might be not precisely correct. Changes in first principles may alter what we consider valid natural science. A type of paradigm shift is possible from AI (Artificial Intelligence) to CI (Community Intelligence). This shift will lose some of the hype and falseness of the notion that intelligence is computable. What will replace this is the notion of cognitive enhancement. The new communication medium will have properties similar to that of a human brain, and of course there are deep differences. The notion of self is seated in the interface between the human brain system and the human immune system. The digital immune system is a different system than is the neural system in biology and in our digital simulations¹⁹. Both are derived from a common set of first principles.

There are greater implications from the new paradigm than merely sitting aside the false notions in the AI paradigm. The shift could turn our educational processes away from something artificial to something natural. As Prueitt puts it in *The American Education*

¹⁷ Prueitt, Paul S. (1995a) A Theory of Process Compartments in Biological and Ecological Systems. In the Proceedings of IEEE Workshop on Architectures for Semiotic Modeling and Situation Analysis in Large Complex Systems; August 27-

¹⁸ Prueitt, Paul S. (1996d). Structural Activity Relationship analysis with application to Artificial Life Systems, presented at the QAT Teleconference, New Mexico State University and the Army Research Office, December 13, 1996.

¹⁹ Levine, D. & Prueitt, P.S. (1989.) Modeling Some Effects of Frontal Lobe Damage - Novelty and Preservation, *Neural Networks*, 2, 103-116.

Bridge,

“We are pretending providing broad based education and the underserved students are pretending to learn. This must be changed and to change this is to end the crisis in education.”

What is possible? Each social group might develop unique qualities and a shared system of signs. Easy, and free, use of a stratified ontology framework allows use of the social network software to generate what are in essence private languages between members of a group. Through open source software we, as individual and as groups, encode a capacity to continue the identity of the group from one day to the next.

Relevance to the Crisis in American Education

The revival of American education may depend on the maintenance and persistence of what we are calling a digital private interior. We fully acknowledge the vast set of social, moral and legal concerns; but stand that we feel that the persistence of digital private interiors is what happens in history, next.

Before we look at how social networks with brains will develop, we should look carefully at this concept of private information in the context of private and public health information and student data held by schools and colleges. We recognize that the problem of informational security and 100% monitoring; e.g., the measurement problem, are tied together paradoxically. So how do we resolve the vitally important information privacy concern for health care and education? Our answer is clear. Current generation 3D computing servers may be equipped with a system of immune systems, one dedicated to each interior. To communicate securely, data is encrypted using the new formalism we have proposed. The measurement problem is resolved by assigning responsibility for holding this information to the individual student. The virtual classroom being developed by Education Worlds™ provides the means through which the individual student uses a focus topic based measurement to demonstrate that she or he has mastered a

curriculum.

In particular, semantic extract from student-to-student communication has an ability to evolve a knowledge repository where each individual in the group may access parts of the curriculum that are not as yet understood. Peer-to-peer aspects are monitored so that it is always clear that education worlds are for the sole purpose of learning a specific curriculum. Curriculums development may in fact evolve so that, for example, freshman studies in mathematics become obviously more relevant to individual learners. Learning may be connected to work force development in such a way that the work is individualized and creative of life styles leading to individual self-employment. Work force development analysis is to be reflected in new curriculum development in education worlds.

The 3D education worlds will motivate individual students to be entrepreneurial in new ways. The world is changing and this infrastructure could play a very positive role. For example, the social communication between individuals in these communication mediums might develop into a product bearing economy. As envisioned in the Bridge, education world activities will create coffee, tea and baked goods business franchises. Community centers could be the center of learning about how to build landscapes and building structures in the 3D simulation worlds. Innovations might be expressed directly as 3D simulations, and new patents filed based on these simulations. The community centers might employ pure market forces to restructure the process through which individuals acquire education and become certified as having capability.

The development of virtual classrooms is part of a larger empowerment of the individual. Our work on learning support programs in Georgia, Alabama, Texas and Vermont has been an essential part of proving that undeserved populations have equal or better capacity than "well-served" populations. The key to understanding this assertion is in the conjecture first advanced by Prueitt in 1984 on acquired learning disability. These students are under stimulated and poorly stimulated, releasing this cognitive inhibition involves understanding the mechanism central to immune and cognitive function.

If this work might be show in a clear way, a national proposal might be taken seriously. The main difficulty I have not been able to solve, at the colleges I taught college mathematics at, is student attendance. I am getting sometimes only 50% of the class each session. A virtual world might be developed where avatars and monitored interactions worked together to overcome this problem²⁰.

For members of under served populations difficult lives often prevent the individual from attending class. However, education worlds must be able to preserve protected information about student grades Monitoring is a vital part of this as is the "neural architecture" and focus topic based self-testing over knowledge and skill in various curriculums. The Demand side pedagogy is demonstrating in Prueitt's college teaching using a modification of the R L Moore learning strategy²¹.

The transformation of our civilization into a digital age also involves the development of our commonly held understanding of natural science. Natural intelligence is to be understood. This means setting aside not only the concept of AI but also other false concepts. We stand on the threshold of a new era in which collective social expression is enhanced not with AI but with individually oriented community intelligence supported by mechanisms that are similar to those in an individual brain. Humanity is approaching a tipping point. One of the possible future is one in which the individual has a greater control over the knowledge that is earned. In this future the common understanding will be sufficient to manage private and personal affairs far better than in the present time.

To achieve the required understanding, we need some parts of general systems theory. In particular, one needs the notion of a utility function that partially governs the evolution of a living system. The required general systems theory understanding is that there are several classes of causes, one class of which is "non-local" and which involves more than one organization scale. Non-locality is seen when complex systems are viewed at more than one time scale. Once some of the concepts are understood and communicated within

²⁰ Prueitt, Paul Stephen (December 2011) Three Dimensional Immersive Classrooms, posted at <http://www.educationworlds.com/pdf/immersiveClassroom.pdf>

²¹ Prueitt, Paul S (published on the web) <http://www.educationworlds.com/research/bridgeppt.pdf>

social structures, things become simpler and more reasonable. Given any natural system the shaping forces may be modeled by utility functions and by principles found in general systems theory.

By supporting community-based discussion about these forces, and mediated exercise of community intention, we may measure improvements in governance outcomes. This improvement of governance will be a consequence of the use of the Bridge to assist young Americans in making the now very difficult transition between high school and college.

Many parts of the system cooperate in creating a problem, because the motivation is distorted by the false concept of ownership. Specific social forces also negatively influence the evolution of science, even while certain types of gains continue to be made. Scientific reductionism is powerful but does not explain the nature of life, for example. The question here is, again, about the extent to which some inquiries about nature are not advancing while other inquiries receive abundant economic support. If our science is directed at creating ownership for corporate entities, then we do not develop that part of what might have been science that might assist the individual in understanding his or her self. Separating the notion of ownership from the notion of understanding therefore seems necessary. However, without the current political crisis the entanglement is unlikely.

The methods developed and expositied in the Bridge could release a large proportion of the current population from a fear of mathematics, in particular confusion about the principles of arithmetic and set theory. It has been tested in over seventy college classes that I have taught between 1988 and the present. *The American Education Bridge* contains some of the history and recounts some of the circumstances within which these classes were taught.

The so-called “demand pedagogy” is fully defined; and we are ready to take a next step. This will be must larger than the insistent work on one man. Opening up what was closed and confused about arithmetic and set theory, is a first step towards opening the individual to the capacity of digital augmentation of knowledge of the self. The learning strategy, when developed and exploited, will lead to startling

new capacity involving the representation of human knowledge in a computational form, the so-called ontological modeling with data standards.

Digital Immune System

With the deployment of a digital immune system, we may develop these social network support systems in two directions. The first direction provides an independent monitoring of parts of the Internet that appear to hold treats. Of course, this is to have judicial oversight and is exceedingly complex. The second is as an independent infrastructure for national collaborative systems, including existing and future private or public simulation world infrastructure. In particular we have focused on education and on public health. This oversight is proper to the fifty states, and when necessary to the federal government. Again, the complete analysis is exceedingly complex.

So, given the brevity of what is proposed, let us look at some of the details. First let us consider the educational processes. Having ontological representation commonly available in a digital medium allows an individual student to take greater responsibility for learning. Prueitt suggests in *The American Education Bridge* that shifting responsible for learning from the teacher to the student is necessary if we are to end the crisis in American education. He introduces the notion that “natural demand” is manipulated. The everywhere present manipulation disrupts the action perception cycles involved in learning. From a demand theory based on system theory he derives a demand pedagogy that is designed to internalize curriculums.

The demand pedagogy is to be revealed in 3D simulation worlds. Learning using demand pedagogy in education worlds gives each individual an ability to demonstrate learning outcomes for purposes of accreditation. This demonstration is though the composition of hand written work that expresses what the student claims to know. This turns the educational process on its head. Student how design their own tests, work the exercises that they make up and then are grades based on the quality of the test and the quality of the presentation. The accreditation power is challenged indirectly, driven by consumers of educational services.

The student him or her self is freed from a system that all too often is involved in owning imaginary problems. A struggle with this manufactured problems is then substituted for real learning processes. A self-not-self view over information is established, allowing individuals to more capably manage his or her academic and medical records. Several capacities are combined. The self-not-self contextualization is developed from immune theory. Cognitive enhancement uses knowledge representation. The neural architecture serves the individual human and supports social networks.

Stratified theory is part of new language where the notion of orchestration is seen as illustrative of how individual or group intention is expressed. The *Bridge* technology recognizes that orchestration is through a set of mechanisms. Of course, the nature of mechanisms may have positive or negative results. The mechanism itself may become used in various ways. Our thesis about AI, specifically, has been that political and business processes amplified conceptual distortion caused by human language.

Non-locality and Distributed Computing

In reviewing the work set forward, we find a number of concerns about the AI paradigm. These concerns are revealed through a study of the foundations of computing and of mathematics. The new paradigm replaces the goals of AI with new goals defined consistent with CI (Community Intelligence) and democratic practices. How is this done? Limits on local computing are recognized and non-locality is capitalized on using distributed computing, and organizational stratification. Distributed computing gives stratified theory a means to simulate the propagation of digital genetic information.

A core problem with consistency and completeness is addressed. Category theory is used to support ontological reification of universals from particulars. The production of human knowledge representation follows what has become standardization in certain circles. The reification arises from measurement in real time using a modified semantic extraction algorithm. The completeness comes from the development of a structural cover over the set of services that are deemed needed by a community. Consistency is reflected in various

inference mechanisms. The process through which completeness and consistency is achieved may be localized to the individual human being, and then shared within well-defined community boundaries.

Security comes from an encoding of process definition in the computing backplate and by a reset mechanism. The Gödel concerns, discussed in the next section, also require a reset mechanism. So two requirements are met with the same set of mechanisms. However, to support real time social communication, very rapid reset is necessary, so as to not disrupt communication channels. The processes involved include stratification of service definition, a computing backplate with digital genetic information, movement of text to numerical hash tables, and keyless tables. In short, the index key may be very quickly re-installed. One nanosecond reset, at least locally. The foot print, maybe several hundred binary bits.

Measurements are necessary, and for measurement to be effective there must be instrumentation between the digital immune system and the larger transaction space for the community. The instrumentation we propose is based on super distribution, as already discussed. Stratified theory is combined with general framework theory (Prueitt, 1985). The combination produces active knowledge management using open source tools by individual humans. Clopen mechanisms must open the closed formal system. The rest of this paper will focus on a description of how to do this reset optimally.

The reset only occurs when there is a specific need to reset. A breach in security is one trigger, however the other trigger has to do strictly with the nature of inference. Inference may sometimes fail certain tests. A formal inference engine may be continuously checked to see if its axiom base is no longer reflecting what is easy seen to be true by an aware and informed human. If the measure of connection is absent, the computing backplate may be turned off, a new rule set loaded everywhere within the community specific infrastructure. A number of tools are available; In particular, QAT is how one might develop a new inference engine. Checking processes

were simplified at a 1997 international conference presentation in Moscow, to VINITI, on an algorithmic voting procedure²².

Over the years we have acquired a number of lessons learned. These include our appreciation of the need for the public to be aware of specific knowledge available from science. We are hopeful. This awareness, shared via social networks, could change our political processes and produce a more full participation in democratic processes. The development of support mechanisms might serve to undo the social damage from AI as well as develop and communicate new and better science to the public. Social networks might develop new political power and this power might begin to change causes that persist and which result in poor educational services to our children.

The technology discussed in *The Social Brain* was integrated as a means to deliver a new communication medium. We expect that the medium will support a new paradigm in education. The solution path involves a separation of social narratives into lines of thought, and proper reference to scholarly literatures.

The *Bridge* technology has the means to represent human knowledge as computable ontology and to move this representation back and forth between text or symbolic representation. This is done through stratification of topic descriptions, expositions of knowledge in symbolic, audio or textual form, and associative mechanisms. As is discussed in detail in *The Education Bridge*, the “stratified” architecture maps to our understanding of the neural architecture involved in human cognition. Access to the technology is made available within the educational infrastructure, as a public service not encumbered by any commercial activities.

This solution requires the availability of social networks equipped with knowledge management tools. The social networks might then develop ontological representations about purposes and outcomes. People are taking charge of democratic processes around the world. The next step is to produce solutions to the many crises we now face. While it is true that the issues are like layers of an onion, each issue reveals another version of underlying mechanism.

²² Prueitt, P. (1997). Grounding Applied Semiotics in Neuropsychology and Open Logic, in IEEE Systems Man and Cybernetics Oct. 1997.

An example may be given. The social dysfunction of the college education system often serves the professional goals of individuals stuck as employees in a dysfunctional system. Coping mechanisms develop and are linked together to create a self-governing community whose intention is to protect jobs. The task of education is overwhelming and so this task is set aside. The stated purpose of college is undermined by a practical need to work thirty years and retire. The example is illustrative of what might be overcome, given the existence of the *National Education Bridge*. Once the knowledge management capacity of the *Bridge* is available, stakeholders may undertake cultural remediation. We may look to ourselves to use 3D simulation worlds to create and implement a better social world. The new directions will come from social networks with ability to develop knowledge representation. New direction will also come from young people.

The Use of Mechanism

Underlying themes in *The Bridge* are seen in our proposed development and use of mechanism. Mechanisms in the biology of the individual, and in the social-biology of communities, are mimicked to the degree possible in a computing architecture for three-dimensional simulated internet-type social network environments. The computing architecture is deemed "purely public". Private interests, such as textbooks companies, are not allowed to invade or control public sector function.

The inquiry about community intelligence has been difficult. We may agree that it is ranked among the most difficult ever faced by human scholars. Much of the foundations to the inquiry into intelligence came before we understood the psychology of the brain, or the neurological processes at the cellular, molecular and quantum levels. And yet much of these older foundations have been held onto, for reasons that may be explained as originating outside of science.

Intention expressed is seen in economic terms as demand. Demand is *how* the individual soul expresses intention, and is thus not a Newtonian type physical phenomenon. The new educational theory is designed to release control over demand and return the American nation to the practice of democracy.

The Gödel issue and Hilbert Space Computing

We must be clear. The Gödel result is not resolved, except through ignoring even Cantor, as well as Russell, Whitehead etc. The fact that scientific materialism must ignore the Gödel result is a fact that we account for and disciplines such as AI do not. In embracing the notion that formal systems have specific limitations we open the door to a necessary solution to the non-removable limitations. This solution must come from the individual human, in the exercise of natural intelligence.

We now turn to the HilbertEngine™ and discussion about the limitations of Hilbert mathematics, and thus to the HilbertEngine™, as currently used. These issues are not un-substantial and are central to the work of Russell and Whitehead, as expressed in *The Mathematic Principia*. Their interest was in pure mathematics and foundations. The *Principia* predated various discussions in computing theory and in foundations. Gödel and others make the linkage between pure foundations in the Principia and work on computing as well as on the representation of human knowledge in computable form.

Prueitt provided some original work on the concept of a countable index. This contribution is related to category theory, and encodes ontological models. This work arose from his hosting a Russian mathematician. Alex Zenkin gave a proof regarding the Cantor diagonalization theorem to Prueitt personally in 1997. Zenkin's theorem shows that the famous Cantor result; e.g.,

the size of the set of integers and not the same size as the size of the set of real numbers,

is incorrect on two accounts.

This proof made Prueitt more aware of the natures of the foundations of set theory and number theory, as well as topology and real analysis. The work is not; it turns out, merely formal theory. The formalisms discussed and developed from Prueitt's exposure to Soviet era applied semiotics led to computing theory. Quasi-axiomatic theory (QAT) is the proper formalism for the very fast construction of an ontological model. Extensive use of QAT in the former USSR was found in the works by the USSR government

agency called VINITI. It is a little known fact that much of the pure science, biology, chemistry and physics, classified within the USSR, 1945-1994, was grounded in both Hilbert mathematics and QAT. All of this was revealed publicly in five ARL conferences (1994 – 1998), as discussed below.

Axiomatic Theory

Prueitt's background in pure mathematics prepared him for a mastery of the formalism of QAT. He specialized in abstract algebra for his Masters in Pure Mathematics from Southern Methodist University, in Texas. He was a student, at University of North Texas, of John Neuberger and Dan Mauldin, in numerical analysis and measure theory, a generalization of the theory of integrals, and vector space transformations. In 1984, he moved having achieved all but dissertation status at UNT, to The University of Texas at Arlington, to work under MIT PhD and leader in the ANN, artificial neural network, community; Daniel Levine. Due to these experiences Prueitt was able to follow presentations in many areas of pure and applied mathematics, and to make contributions that are purely mathematical in nature.

Several formal proofs are available regarding the non-removable limitations of Hilbert-like formalism. This has led us to look to the foundations of logic and mathematics at an even deeper level; e.g., that exposed by quasi-axiomatics. QAT and Zenkin's separate formalism in pure mathematics has is category of these very deep results, not commonly known in college mathematics departments. Zenkin's theorem countered the famous Cantor theorem. Once the Zenkin result is understood, there is a question that arises regarding the consistency argument developed by Kurt Gödel.

Zenkin on Cantor and Gödel

So in summary, Cantor's diagonalization of a listing of the positive integers does not prove the existence of multiple types of transfinite categorical abstractions. A determined Internet search will find this particular proof, with the precise detail. It was to lead us to look at the formalism of description logics and knowledge representation languages. Our reading in various publications, and our taking part in various discussions, was part of a long look, taking the period from

1998 to 2000. In spite of what might be errors in Cantor's descriptions of transfinite numbers, there is a clear logical error in depending on any theory about logical error. This statement is a summary of the "Gödel results". The summary may be also stated as follows:

"We just cannot know if a computed result is correct."

This is an absolute consequence from formalism, as A. H. Whitehead has shown in the early part of the twentieth century. The error shines light on results that British logical positivist B. Russell, and A. N. Whitehead had regarding their *Mathematical Principia* in the early part of the twentieth century. The Russell paradox is stated;

"The set of all sets is a set." *Of course, the set of all sets cannot be included in the set of all sets.*

There was also a separate and distinct error that is purely mathematical formalism in nature. Prueitt's version of this second error is:

"One does not have a right to create an *index on a set that is empty.*"

We create an index when one did not formerly exist. We create deductive formalism out of an inductive process. This creation; however, follows QAT guidelines.

Creating Indexes on Empty Sets

Now we apply what might be considered to be some esoteric results from the foundations of mathematics and logic. Ontology computing may produce reasonable results that are simply not true. This is the final danger from the paradigm of AI; e.g., that we forget that computers do not form, by nature, a living system. We mean in the sense that biological systems are living. The capacity to experience reality in real time is the single property that separates the two. This is the same distinction seen in Zenkin's result and has to do with induction. This distinction has consequences.

A record must be made at each interrupt point, so that humans may examine a log file, otherwise the system is not properly checked.

Systemic errors in computing processes cannot be predicted with 100% certainty. When there is an error, there is no efficient formal means to check, and thus a human must, so as to reduce a vital risk, be in the loop. The human must be called on to create the initial judgment as to what the meaning of the data is.

Returning to the topic of category theory over ontology models. Prueitt has called this the *emptiness property of sets*, perhaps due to private conversations before and after Zenkin's proof. The well-recognized *Axiom of Choice* directly contradicts the *emptiness property of sets*, but only for empty sets.

One cannot select one element out of a category for which there is no particular instance. The category is empty. The Axiom of Emptiness is evoked.

One finds that the *Axiom of Emptiness* is not evoked in computing theory, creating errors in inference engines and knowledge bases. The question is regarding how an index might be created without prior form. We have asserted that the creation of instances to populate an empty category is not possible using deduction, by itself. Induction is necessary, but a natural induction; e.g., as in electromagnetic induction, that is not the same type of induction as in mathematical induction; e.g., as in the definition of the set of positive integers.

The *Axiom of Emptiness*, or something equivalent, and the *Axiom of Choice* were used together by Zenkin to show that the famous proof of Cantor has two flaws. The Cantor proof is still elegant. Kurt Gödel may have taken Cantor's work on transfinite numbers into consideration in indexing theorems within a formal system. Something was hidden to both of these towers of mathematics.

Cantor's main argument regarding the size of sets has two errors²³. We cannot have a formal process that produces a pure measurement of an event in the real world. To ignore this result is to NOT be a pure mathematician.

²³Materials formerly at www.bcngroup.org/journal/ccg/beads/one.htm (removed from the Internet and stored on my web backups) this set of research notes is now at www.ontologyHub.com/journal.zip and also html file embedded in this zip file: Select: Desktop/journal/ccg/papers/statement.htm if a data transfer has occurred.

Mill's Logic and Axiomatics, again

The literature on this is significant, including the whole of the work by Robert Rosen²⁴, and others. This literature shifts the social discussion from AI to some well-developed sense of community intelligence. We move from pure mathematics to the examination of the several flaws in the AI paradigm. Then, after a while, we define a means to create formalism instantly, using pure observation and a quasi-axiomatic process. Mill's logic is used as well as models of neural architecture.

Events carry a new context, "9-11" for example. Cognitive computing as developed by Zenkin; this material is not public domain (Prueitt and Zenkin, 1998), may be applied to understanding artificial systems - such as a DARPA multi-agent agency technology (Prueitt, 1998 at ARL conference in new Mexico).

The computer by its nature is a simple machine in Rosen's sense, and will never produce natural induction – even though there are formal constructs around the notions on stochastic induction and what are called hidden Markov processes. Hidden Markov processes assert that there is no influence from history not immediately past history. So we need at least a non-Markovian mathematics to model stratified processes. Markov processes assert as an axiom about ontology that all causes are local in time and in space. This is not one of the axioms of mathematics, but an add-on. The add-on is present in much of modern engineering and natural science. The new work attempts to address the required extensions of Hilbert mathematics, using ontological modeling.

²⁴ Rosen, Robert Anticipatory Systems, 1985, Pergamon Press