A Many-perspective Approach to Knowledge Production

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Abstract

This paper will discuss a "partial" historical lineage to *A Many Perspective Approach to Knowledge Production*. It seeks to unpack why such an approach is fruitful. It ends in discussing a major research project call *The Insight Engine*, designed to computationally enhance such an approach.

Key Words:
Knowledge Production, Computational Approach, Memory Theatre, The Art of Memory, Human as Computer, Computing a reality

The dynamic specifics of how we articulate the Who, What, When, Where, and Why of any event, become central to an ongoing process of *acting, learning, and understanding*. We build up social, cultural and linguistic knowledge over time that informs our projections onto any event, in a space of reciprocal forming[1]. Our ability to use language arises out of participation in a diverse set of communities. For any observed event there are a series of disciplinary, interdisciplinary and transdisciplinary perspectives that can inform it, especially if we seek to look at knowledge production and how the body functions in order to accomplish this, in a holistic manner. Instead of thinking of reality as "objective," this approach suggests that the understanding of reality is relational to a given observer, and to their social, cultural, and informational milieu as an overarching framing context. Each process/event has a context and a multi-modal history of pattern flows that informs how we come to understand it in an ongoing manner[2]. Yet, the notion of understanding the whole is a paradox – zeno's paradox, because each time we metaphorically move half-way closer we also open up new perspectives and understandings— the concept that we can infinitely open up new understandings, is one of these understandings. We can never get at the "thing in itself" completely. We can only seek to approach it in an ongoing manner; to 'chip away' at coming to know it; to project into it more fully, and to intelligently "point" in the sense of Wittgenstein. We might ask in a Koan-like manner, *when was the first self-reflective thought*? When was the 'meta-level of observation' born into this very long Darwinian chain that finds us in the here and now? As an educator can we can seek after the multi-perspective approach to knowledge production as a pedagogical goal. In terms of science we might point to Anaximander[3] who lived "26 centuries ago in Miletus, a Greek city on the cost of what is now Turkey"[4]. Anaximander sought to articulate natural laws, to question knowledge production in an ongoing manner, and to continue learning and "reimagining" the world as an ongoing process. Rovelli in "The First Scientist" speaks about Anaximander's scientific methodology, "Its way is fluid, capable of continuous evolution… it is able to overthrow the order of things and reconceive the world time and again."[5] A multi-perspective approach to knowledge production perhaps has its roots in Anaximander's achievements as discussed by Rovelli: he was the first geographer; biologist contemplating the possibility that living beings evolved over time; the first astronomer, making a rational study of heavenly bodies and seeking to reproduce them with a geometrical model; the first to propose two conceptual tools that would prove fundamental to scientific activity: the idea of natural law, guiding the unfolding of events over time and by necessity; and the use of theoretical terms to postulate new entities; hypostases used to make sense of the observable world; he questions in an ongoing manner, and developed the first map of the world is drawn in depth. [6]

He thus opened out a fascinating multi-perspective approach to knowledge production – the thoughtful undertaking of the "continuous re-envisioning of the world".[7] A larger question is how

do alternate perspectives representing the different branches of knowledge, inform each other? Is there an overarching connectivity across different branches of knowledge where study of each reinforces, helps us to 're-understand', and/or resonates with the other? Is this a move toward the "unity of science"[8] or to an even larger quest, for the unity of all knowledge (Consilience)[9], incorporating also the arts and the humanities etc.? Anaxamander believed (as did Leonardo and other thinkers) in the connectivity of all things in his concept of the "boundless" or "unlimited", in Greek: *"apeiron,"* that is, "that which has no boundaries")[10]. This represented thinking in a deeply "abstract" manner. In terms of common modes of abstraction used in knowledge production, we employ the use of logic— induction, deduction, and Pierces' notion of abduction[11] as well as the employment of multi-value logics, and more recently "physical" logics[12]; computer code; metaphor[13]; mathematical approaches; the creation of analogues; the use of dialogical approaches — simple conversation and/or group discussion as well as via visualizations and sonifications of data. As each perspective falls in relation to another, what can this set of relations between differing modes of inquiry illuminate about the world? I would suggest that Koestler's[14] early notion of bisociation involved in the "creative act" is central here. We borrow from the embodied history of diverse understandings from different contexts, and think on two (or more) different planes simultaneously, forming a new thought assemblage. Seaman coined the term polysociation for the notion of drawing on more than two planes. Here we can point to to Leonardo's "Principles for the Development of a Complete Mind":
Study the science of art. Study the art of science. Develop your senses — especially learn how to see. Realize that everything connects to everything else".

The problematics of the continuum is also of interest. Along with seeing the benefits of the connectivity of all things we also must isolate aspects of a given problem (at least temporarily) to approach it. The complete set of all categories that make up this continuum can never be fully articulated because it is always growing. The temporary parsing of these categories, as determined by a particular sets of observational methodologies is driven by the needs of differing "perspective approaches" which are also always changing i.e. we might understand aspects of the body through physics, via biology, psychology, neuroscience, linguistics, philosophy, physiognomy, and further via differing forms of technology…etc. Along with the above approaches, how do we educate for the pragmatic goal of developing what we might call tacit, or pragmatic embodied knowledge? [15]

This multi-perspective approach as extended though computational technologies, puts science in a new space, one that generates knowledge about these multiple perspectives as 'data' and simultaneously seeks to find ways to search, store, combine, correlate, recombine, and make dynamically relational, these digital information perspectives[1]. We can look to earlier scientists exploring memory theatres as planting the seeds of this thought. Yates in *The Art of Memory* discusses Camillo's *Teatro Del Mundo*:

> [It was] Designed as a "memory theatre" working with associational connections between symbolic images and memory. A spectator would sit at a central location inside a portable wooden structure, which contained seven groupings of information, each accessible from seven different levels. The viewer would engage with an environment designed to reveal secrets about the structure of the universe, from the microcosmic to the macrocosmic.[16]

We can point to a lineage of thinkers that have employed a diverse set of methodological perspectives in developing their research, informing "a Liberal Arts" approach to education. In short it is an approach to learning that empowers individuals; prepares them to deal with complexity, diversity, and change; provides students with broad knowledge of the wider world (e.g. science, culture, and society); as well as in-depth study in a specific area of interest… to develop a sense of social responsibility, as well as strong and transferable intellectual and practical skills

[1] In conversation with Olivier Perriquet.

such as communication, analytical and problem-solving skills, and a demonstrated ability to apply knowledge and skills in real-world settings.[17]

Each time-based process has an infinity of ways to understand it, unfolding over time --- each contextual moment has infinite depth depending on how we look at it, how we project into it from our knowledge-base, and how we parse it. If we are open to new ideas our knowledge-base continues to grow over a lifetime. Each new context potentially opens out a new line of thought --- - a new set of associations which may impact earlier assumptions. This is meaning-becoming in situ— the life long process of coming to know the world and ourselves.

Why should we want to look at things from more than one intellectual perspective? How does this help us in terms of problems or concepts that involve many disciplines, interdisciplinary thought, and even transdisciplinary approaches? I am quite interested in what I call Recombinant Informatics— to "intelligently" explore in a combinatoric manner, many different perspectives, where any two are also suggestive of new potentialities of of research.

In philosophy, there is a long history to combinatorial exploration. The practice of Lull, as described by Gardner, presents an analogue combinatorial mechanism:

> In every branch of knowledge, he believed, there are a small number of basic principles or categories that must be assumed without question. By exhausting all possible combinations of these categories, we are able to explore all knowledge that can be understood by our finite minds. To construct tables of possible combinations we call upon the aid of both diagrams and rotating circles...[i.e.] to place two or more sets of terms on concentric circles. By rotating the inner circle we easily obtain a table of combinations. [18]

Gardener in his book entitled *Logic Machines, Diagrams and Boolian Algebra*[19], elucidated a fascinating lineage, starting with a series of unique individuals, deeply interested in multi-perspective approachs to knowledge production in line with the creation of Memory Theatres, and ending with the computer as we know it today. These 'theatres' were 'analogue' databases. Gardner speaks of a lineage that moves from Lull to Bruno, to Leibnitz who was "fascinated by Lull's method"[20] and at age 19 wrote "the *Dissertio de Arte Combinatoria (Leipzig, 1666)* in which he discovers in Lull's work the germ of a universal algebra by which all knowledge, including moral and metaphysical truths, can one day be brought within as single deductive system."[21] Gardner goes on to say: "…many historians to credit Lull with having foreshadowed the development of modern symbolic logic and the empirisist's dream of the 'unity of science'."[22] Yet the lineage continues when we find that Lovelace, the first programmer working with Babbage in the 1800s, was influenced by Leibnitz's *Ars Combinatoria* and of course his calculator. Thus we migrate from Memory Theatres to Theatres of Computation. We also move thought the notion of the human as computer.

Later, Lewin's *Topological Psychology*, developed another variety of multi-perspective space in terms of understanding aspects of the body— mind/brain and environment, relationally. He was interested in articulating an approach to psychological spaces, simulation spaces and physical/actual motion spaces.

In terms of pragmatics I am very interested in how a multi-persepctive approach can be used to elucidate the workings of cognition and in the long run in exploring Sentience and the notion of developing a machinic sentience which Seaman and Rössler call Neosentience[23].

Von Foerester, founder of the Biological Computer Lab[24] at University of Illinois talked of cognition as computing a reality.[25] If we think of the body as an electrochemical computer we can ask ourselves what is at operation in the body in terms of mixed modes of computation that lead to sentience production? To undertake such a complex study we must take on a multi-perspective approach. In particular I am interested in observing the body/brain/mind/environment as a continuum involved in a process of ongoing becoming. As discussed above, this continuum

already poses a problem— we must make our entity finite (or articulate sections of it) in order to study it effectively. Yet, here is the rub, sentience appears to be an emergent phenomenon that arises in a still unknown "emergent" combinatoric manner. Where should we draw the line especially in terms of processes of becoming— these might include the following processes: molecular, that embody elements of emergence and change; biological; linguistic processes that frame the above yet are constantly being re-understood; ethical; bio-physical, processes of modeling and mathematics; poetic; historical; philosophical; mapping and modeling; logical; and playful…each of these foci has relevance to the problem set of Neosentience research. Seaman and Rössler have been discussing ideas surrounding this study for over a decadeas discussed in their book *Neosentience | The Benevolence Engine*[26] It is a paradoxical humanist endeavor, in that one must come to know the body in a way that has never before been articulated. And through this deep study of the body and its functionalities as well as through biomimetics and bio-abstraction, new machinic entities can be generated.
The ultra-complexity of the human body/mind/brain/environment set of relations make the entailment of its functionality a very long-term mult-perspective problem. Entailment here is defined as "something involved as a necessary part or consequence of something."[27] The body is a network of networks of delicately balanced consequences, reacting and interacting with the larger environment that it is nested within.

To approach this hugely complex multi-perspective problem I have decided to develop a system I call— *The Insight Engine with* Todd Berreth and Olivier Perriquet. This system seeks to draw on my long history as a media researcher, designing new forms of interface and qualities of interactivity, and to expand this via a strong interdisciplinary collaboration that bridges Neuroscience, Computer Science, the Arts and Humanities at Duke as well as through international collaboration. This research seeks to work toward the digital authorship of a tool to empower insight production, distributed interdisciplinary team-based research and to potentially enable bisociational processes as articulated by Arthur Koestler in *The Act of Creation*, discussed above. The bisociative act connects "previously unconnected matrices of experience…".[28]

If we reverse engineer differing research practices across multiple disciplines we can assume that many researchers undertake similar practices. Interdisciplinary research also means crossing "linguistic" domains framing that research. Here the generation of shared language (developing bridging languages) is essential.

The notion here is to explore Neuroscience through the associative "lens" of focused computational interactivity, functioning in the service of providing new insights and associations across interdisciplinary research fields, as well as exploring different concepts and foci from within individual research domains. One can envision an interactive touch display that would enable a user-centric experience, "driving" the generation of a visual set of associative experiences, by bringing terms and media-objects into visual proximity, and by searching for relevant new terms and media. Such a work will function both on a local level in a visual installation to be displayed at Duke, as well as on a laptop or ipad driven across the internet.

Outwardly, the initial experience will be aesthetic and participatory in nature— the system will be designed to be focused in different user-driven directions. Thus, though a network of "pre-seeded" choices one could drive the system to focus on Neuroscience-only related topics of association. Alternately one could juxtapose texts and images from the arts and humanities — poetic texts, critical/social texts, texts related to ethics, or historical texts from multiple fields— this depends on the initial seeding of the system, and choices of the interactant. One could also query the user to select from a scrolling list of topics and/or textually add a topic area. This would also include images, video sections and models from multiple fields. Thus, one would begin with a "seeded" database of relevant materials. Along with the database which would be added to in an ongoing manner, relevant internet searches could bring up new materials for juxtaposition.

Thus, the Insight Engine posits a contemporary approach to the Multi-perspective approach to knowledge production.

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