Reinterpreting the Universe as systems with a single programmatic intent to preserve structure.

Tariq Khan
*Department of Computer Science*
*University of Nebraska at Omaha,*
*Omaha, Nebraska, USA*

A pattern appears to exist in the Universe based on a foundational and simple rule. It is possible that every aspect of our reality of objects and processes can be interpreted as systems with an apparent intent to preserve structure - as physical form or as information. We can see this fundamental principle or rule at various levels in a structural hierarchy of complexity in our Universe increasing from the traits of consistency and fecundity, at the smallest of scales, to traits of diversity and consolidation, and then to optimizations in time, memory, resiliency, and redundancy amidst scarcity and competition and finally culminating, in the "use" of minds and "aggregate minds as agents" ultimately to preserve structure as concepts as information in mental ideas.

*"Who can dream of God? This man did. In his dreams God was much occupied. Spoken to He did not answer. Called to did not hear. The man could see Him bent at his work. As if through a glass. Seated solely in the light of his own presence. Weaving the world. In his hands it flowed out of nothing and in his hands it vanished into nothing once again. Endlessly. Endlessly. So. Here was a God to study. A God who seemed a slave to his own self ordinated duties. A God with a fathomless capacity to bend all to an inscrutable purpose. Not chaos itself lay outside of that matrix. And somewhere in that tapestry that was the world in its making and in its unmaking was a thread that was he and he woke weeping."*
*— Cormac McCarthy, The Crossing*

*principle*

- a fundamental truth or proposition that serves as the foundation for a system of belief or behavior or for a chain of reasoning.
- a natural law forming the basis for the construction or working of a machine.
- a fundamental source or basis of something.
- a fundamental quality or attribute determining the nature of something; an essence.

*system*

- a set of connected things or parts forming a complex whole, in particular.
- a set of things working together as parts of a mechanism or an interconnecting network.
- a set of principles or procedures according to which something is done; an organized scheme or method.

*intent*

- a usually clearly formulated or planned intention: aim.

*structure*

- construct or arrange according to a plan; give a pattern or organization to.

*information*

- what is conveyed or represented by a particular arrangement or sequence of things.

*pattern*

- an arrangement or sequence regularly found in comparable objects or events.
- a regular and intelligible form or sequence discernible in certain actions or situations.

*time*

- the indefinite continued progress of existence and events in the past, present, and future regarded as a whole.
- plan, schedule, or arrange when (something) should happen or be done.

*evolution*

- a process in which the whole universe is a progression of interrelated phenomena.

*dichotomy*

- a division into two especially mutually exclusive or contradictory groups or entities.

*yin and yang*

- In Chinese philosophy, the feminine or negative principle (characterized by dark, wetness, cold, passivity, disintegration, etc.) of the two opposing cosmic forces into which creative energy divides and whose fusion in physical matter brings the phenomenal world into being.

*cellular automaton*

- a hypothetical computing machine that can reproduce itself.

*entropy*

- a thermodynamic quantity representing the unavailability of a system's thermal energy for conversion into mechanical work, often interpreted as the degree of disorder or randomness in the system.
- lack of order or predictability; gradual decline into disorder.

A pattern appears to exist in our visible Universe based on a foundational and simple rule. Every aspect of our reality can be interpreted as a system with an apparent "intent" to preserve structure. This is done literally in physical structure or in the form of information. This is logically equivalent to the "avoidance of destruction" for each given system or structure or to the avoidance of the complete elimination of all the items in that system. We can see this fundamental principle or rule at various levels of complexity in our Universe as if they are distinct levels in a hierarchy. The repetitive nature of this ruleset or principle can be compared to self-similar fractals when a fractal examined via magnification. We can see at these "structural levels of complexity," systems "behaving" as if they are following this programmatic root principle, thus anthropomorphizing systems as if they are competing against a near equivalent but opposite fundamental aspect of our Universe juxtaposed to destroy or reduce these very systems and structures akin to the ancient Chinese philosophical concept of "yin and yang." We see systems demonstrating almost algorithmic actions to create, optimize, and copy structures and information to "preserve" them throughout time. Note that it is difficult if not impossible to describe the observable actions of systems, especially results created over long periods of time, by not utilizing human-centric verbs, so understand that this usage is done here with the known awareness of the obvious lack of appropriateness and done for the goal of easily communicating key concepts.

Systems in our Universe appear to "utilize" "whatever means necessary or available" in an apparent competitive struggle versus forces intent on eliminating structure akin to entropy. The commonality of this pattern is so ever-present that it, at the very least, implies a key dichotomy in the Universe starting at the foundational beginning with the split between "nothing and something." However the observation of this pattern extending into structural hierarchies is analogous to the hierarchies of learning in the human mind (i.e. from lines, to letters, words, sentences, etc…) or even to quantum mechanical shells or orbitals in atoms. The trend of this move to more complex or "higher" levels in a structural hierarchy trends from physical and inert matter to ever more ephemeral levels of concepts and ideas existing, as far as we can confirm, only in minds.

One can extend this principle to imbue the structure-protecting-half of reality as attempting to find a place to store or ensure the existence of these learned or optimized concepts or structures as the physical matter in the Universe moves existentially toward destruction from entropy driven heat-death and from the force of Dark Energy literally ripping the Universe apart until its final "big rip" in the far future. We can speculate that perhaps the ultimate roadmap or intent of all systems in the Universe is literally to reach the state of minds and aggregate minds that might have access to "mental worlds" akin to Plato's eponymous world or Roger Penrose's "worlds of ideas" separate from the physical universe (where lie perfect circles and mathematical concepts like pi etc…). Under this paradigm the Platonic world might be analogous to a computer storage memory or "hard drive" to store or preserve structures as information or outcomes or even perhaps outputs or solutions from perhaps a specific "run" or instance of this, our current, Universe as if the entire Universe is a program.

It was in the context of regarding lifeforms that the process of evolution was identified. The concepts of natural selection (survival of the fittest) and genetic mutations were understood as mechanisms in the "process" of evolution. But perhaps, along the lines speculated by Ed Friedkin and Stephen Wolfram in their theories of cellular automatons, the process of evolution follows simple and basic rules or a rule along the lines of proposed single principle of preserving structure. By proposing this fundamental rule, akin to maintaining structure or having an intent to "survive" in a literal Universe - mirroring the historic computer science game called life - then perhaps concepts like natural selection are not so "natural" but actually derived from this deeper underlying principle.

So is it possible that a single fundamental and simple principle can create a Universe of such complexity? There is evidence to support this. Obviously the Universe is believed to have originated, or re-originated, from a primordial event some 13.8 billion years ago known as the Big Bang – or Big Bounce – wherefrom all things in our entire Universe arose. This can be seen from the Cosmic Microwave Background (CMB) radiation data from various experiments in cosmology and astronomy. But let us not focus on creation concepts but rather note how a single common origin may provide support for the concept that there is also a single common principle as a starting point. This starting point may also help to explain how so much of our Universe is not somewhat, but rather perfectly consistent in the form of fundamental particles (a point that should be one of the most profound in all of history but somehow is taken as a prima facie given). If we ignore models that describe reality or our Universe as a simulation or computer program, where fundamental constituents are encoded or produced "on demand" or where there is only a single electron in the entire Universe, then we are left with the fact that the perfect consistency seen in our Universe in these standard model particles like electrons, quarks, and baryons likely also implies a common principle or original form (i.e. a root electron or programmatic structure for an electron) from which copies are theoretically made or, at the very least, an object that is the exact answer or precise output of some process or calculation (if you calculate 2+2 you should get 4, so an electron may simply be a similar solution or output).

Now if we elaborate on this concept of a single fundamental "drive to maintain structure," or to not destruct into nothing but to remain and exist in a framework of time, then we begin to see additional interesting analogs in observations of our Universe. We can begin with Quantum Mechanics itself. Quantum Mechanics as a theory, that many consider describing the root or possibly all of our Universe, describes or creates a reality of extreme consistency - as can be seen in the precision tests of Quantum Electrodynamics (QED) - and also a reality of extreme complexity - from the possibility of multi-verses to the infinite (continuous) number-line required for the Schrödinger wave function. But wave functions evolve over and require time and observers to decohere and to exist. So if we examine Quantum Mechanics in this context it can appear as a system or set of rules that perhaps is not just used to enable reality or to create "the stage" of reality, but perhaps as a root system from which the fundamental concepts of consistency and fecundity and precision originate.

One may also inquire as to then why the existence of Quantum Entanglement but, again, Quantum Entanglement may simply be matter or programmatic structures "using" quantum mechanical "tools" or the Universe itself using Quantum Mechanics to ensure its structural existence or integrity via the logical requirement for framework consistency and if this thus entails a "need" or mechanism to ensure the internal consistency of Quantum Mechanics, then it is not a leap in our model to see how Quantum Entanglement can exist. One may also ask along the lines of Plato exactly "where" are these instantaneous entanglement connections existing (i.e. perhaps outside of our physical universe) in which case perhaps Quantum Entanglement intimates at the existence of a hyperspace like Plato ultra-reality or reality outside of our physical Universe.

Perhaps the reason all fundamental particles are all consistent and exactly the same is that as they are representative of the existence of this fundamental principle. It is these very particles that are used as the literal building blocks of all matter in the Universe and their very integrity or stability (via consistency and fecundity) that allow them to remain and persist over billions of years until that variety of higher elements above hydrogen, helium, lithium, etc… are created from stellar supernovas. Perhaps the principle itself is involved in an eternal process akin to a "war" of structure against the lack of it? From building blocks of consistent particles we see a Universe grow, evolve, or coalesce into the complex Universe of physical laws, chemistry, biology, sociology, and psychology we live in today. But as our Universe has grown in, or matured into, complexity, perhaps so have the matching processes of existence (or perhaps they remain like the hand of a clockmaker behind the curtains or like computer code external to a display).

So let us examine evolution relative to organisms. Evolution appears to be more than just "natural selection" driven by luck and accidents. Evolution, in a sense, appears to "takes full advantage of all the cards available to be played." Given the extremely diverse possible genome available in DNA combinations and permutations we, logically, end up with a biosphere of incredible variety. Consider, even in the human context, the existence of suboptimal forms like a psychopath. A psychopathic individual does not directly provide an evolutionary "benefit" to a gene pool or a tribe while altruism, as wonderfully noted in the book *The Selfish Gene* by Richard Dawkins, is shown to be a valid strategy and as a very natural behavior (not to mention also by John Nash's equilibrium and John Von Neumann's game theory) and as, quite literally, the optimal solution to long-term survival in a world of scarcity and of many players; recall the oft repeated mantra that the number one requirement of every human resources department is the ability for an employee to work in a team. The existence of a psychopath in the human genome may, however, provide a "benefit" to a deeper principle or intent that is wanting to ensure the existence of "at least one" or even "any possible form" of possible human organism to avoid the possibility of extinction of all of them. Thus we can envision the existence of this abhorrent form as not exactly akin to a form best-fitting an ecosystem or benefiting a gene pool but, rather, one of many forms to ensure the existence of the set of similar forms versus the extinction of that set of forms; i.e. a psychopathic mind is still a mind and is better than zero minds in a Universe where minds are scarce.

In this view, evolution "uses" every possible combination it can to allow the structure of a human organism to continue to exist. Now evolution is not a system with a "memory." In a sense to overcome (perhaps bypass is a better word) this limitation, evolution (again as a system following the principle in question) simply "throws numbers at the problem"; i.e. how humans "throw money" in attempts at fixing a problem. Note that if we reduce survival in this context down to increasing the number of possible strategies or "choices," then we can see how evolution cannot "remember" or track "which path" failed so that it will not waste time but rather always try another new path next (genome variation that is optimized for an environment a la black moth versus white moth) but, rather, and strikingly much like Quantum Mechanics, it tries "all possible paths simultaneously."

One could reverse this argument to suggest that, potentially, Quantum Mechanics itself is simply the optimal or evolved mechanism to preserve structure out of all the possible strategies that do not utilize memory (or the ability to pause - in time - to compare and plan). Evolution is, in this sense, is not just emergent but again seen in a context of having an intent to preserve structure. It is the actual variety in the large numbers themselves that primarily drives its success. The large numbers being the counts of genes, species, actual organisms, available ecosystems, etc… to counter the variety of potentially exterminating threats over eons of time. This use of randomness and variety or diversity in the large numbers of combinations and permutations is an essential aspect of life that provides it a tool or mechanism to survive in environments that are harsh where resources are scarce and where competition for resources exists. In this framework we can redefine life as "complex structures intent on existing and promulgate adapted information." Note that in regards to living organisms the expression "to prosper" is simply "to hedge" against the risks of the existence of one's self or species ceasing to exist.

Now while fundamental particles may have or utilize the properties or strategies of simplicity, consistency, and fecundity, complex organisms or structures - by relative comparison and scale - do not (there simply are not quadrillions of humans) and thus any "drive" to ensure existence is beyond that of attributes or strategies like consistency and numerical fecundity and are rather the ones akin to diversity or the "maximization of parallel approaches" for optimization of chances at survival.

Thus returning to the previous example, if a situation should arise where only a psychopath will survive an existential threat (e.g. a greedy person with zero empathy might ensure the survival of that one person's body and genome if supplies could only last a required duration of time for a single person with a small group stranded on a desert island) then a genome with a fundamental intent or existential drive will have optimized its chances greater than an evolutionary or "Selfish Gene" strategy where "ethical sharing "of resources perhaps actually leads to the extinction of the form or species in the island scenario. Perhaps the expression "to live" is more akin to "to go forth and maintain structure" as evolution has no preference in which form (it has no memory) it simply is a forward-moving rule akin to a cellular automaton that simply wants to exist and to preserve structure period. Thus, if there are numerical genomic options for the total "angels" and the total "devils" (psychopaths) in the human genome, and enough genes or atoms to create them, then, like a baseball batter getting additional chances at the plate, evolution will make, produce, allow those forms and if the environment permits or determines that those forms can survive, then again "so be it" from the perspective of evolution.

Within the framework of a fundamental principle to preserve structure, we can see how systems from Quantum Mechanics to biological evolution do not have or utilize "memory" and thus preserve structure by the basic strategies of consistency and fecundity and then diversity or variation from large numbers. But the complexity of the Universe may also have led to the expansion of this drive into systems "higher up" in a structural hierarchy that involve also "optimization in time" or the maximization of resources as scarcity becomes a limiting factor and time, or lack of the ability to maneuver in time, becomes an existential risk factor especially in environments with competing and faster organisms. Thus, perhaps, we see the possible evolution or "direction" of evolution in nature toward the creation of cells and life forms - and possibly even minds themselves – as not a progressing or advancement of lifeforms intent on complexity in and of itself, but rather as the byproducts of mechanisms to ensure the existence of forms using any and all available tools. This would include mechanisms like memory and brains and minds and thus consciousness itself may be simply the next more advanced strategy or mechanism in line to allow physical structures to exist (often as ideas or mental forms) by these structures surviving and propagating via memes, ideas, concepts, identities, or cultures. One might logically argue then that consciousness is simply the logical evolution of this overall principle, perhaps out of competitive necessity again (a la "survival of only the fittest") to be able to gain an advantage and survive. That advantage thus creating devices that can store "which path" or "choice lessons" thus allowing survival, especially if this entails an environment where scarcity in the amount of variation or resources is limited. Thus, again, we can consider a brain, or more specifically consciousness, as not necessarily something designed or created to bring about the "majesty" of a human "self," but rather as a mechanism needed for structures to exist amongst situations of extreme scarcity. This would make sense especially amongst larger organisms that require so many resources to sustain them and thus logically can, literally, "not afford" to "try every field in the savanna" to find food, but rather must remember which ones were promising and which were sterile and to be able to observer, remember, compare, consider, decide, and plan.

Today, the possible epitome of a structural hierarchy in our Universe may be systems that only exist via the shared information or knowledge of many minds. Consider concepts like money and stock markets. These agent-based systems are the next level of a Universe of systems in a hierarchy working to maintain structure in time but now, instead of using consistency, fecundity, diversity, memory, and minds, it uses those very aspects in diversified agents to maximize its preservation of structure or integrity of existence via its newfound redundancy or resiliency as well as it maximization of resources.. Whether via a treasury department bailout or a 401K expansion the structure or concept of the Wall Street stock market "survives" by using the resources and resiliency of external minds as agents.

Moving into philosophical circles, again we can ask, "is not Quantum Mechanics also at this same top level of structural hierarchy but to its logical perfection as it also uses external minds and agents to perform decisions and decohere wave functions via observation?" Does this not then bring about a logical full-circle akin to John Wheeler's famous "Participatory Universe" or participatory anthropic principle? Perhaps, in the context of this proposed framework, Quantum Mechanics can be compared to a "tool shed" from where systems copy or utilize mechanisms including consistency, fecundity, diversity, and redundancy, as well as optimization in time (memory), energy, and location with agent-based concepts still the possible pinnacle as in agent-based systems all the memory space and energy and risk are utilized in shared external resources akin to Bit Torrent computing. If we see a hologram as the pinnacle of agent-based or shared or "distributed resource allocation" (where each component of the overall systems has all the information to represent the

entire system) then again perhaps we have come full circle with new concepts in physics involving a Holographic Universe or Holographic Paradigm?

Returning to the origin of the Universe, if we have only a "nothing" and a "not-nothing" can this "not-nothing" - similar to the classical debate in the Foundations of Quantum Mechanics - exist without an observer? If yes it can, then what is our Universe? Is our Universe then perhaps not just a simple cellular automata or program being run (input time and let the "program" execute in time) where a rule as simple as "preserve structure" might soon "create" output akin to physical laws (gravitation), or Quantum Mechanics, standard model particles, as well as objects (black holes, galaxies, planets, continents) and organisms and minds where level-upon-level of "maintain structure" become stacked in a fractal--like hierarchy and, if so, what could or might yet in the future lie above our current level? To state this state again, the Universe can be defined as a fundamental "rule set", similar to a cellular automaton executing and then moving up a "hierarchy of levels of structural complexity" starting with systems-without-memory from Quantum Mechanics to biological evolution to systems with memory including minds and then to distributed resilient systems with many minds or agents (some would argue that the "delayed-choice quantum eraser" implicitly has a "memory" while others would argue a misunderstanding of reality - a la the existence of a multi-verse - or a misunderstanding of time, but I would argue it is simply a "system" that, in order to maintain the logic of its internal and inherent "structure," must be consistent and thus concepts like past or future might become "subservient" to the necessity of the maintenance of the consistency of this structure as again the primary principle). These original mechanisms that have "optimized" every possible "strategy without time systems or memory systems" then progress into systems with memory. Again note how this has a real world analogy with the evolution of computer architectures and memory systems moving from simple memory to multi-level cache memories and parallel processing etc….

A strength of this model is its unification of a Universe with consciousness and minds with a Universe with a theory of evolution and with theories of fundamental particles with all of them sharing at their core the same principle. But, if we accept the model, note the fascinating potential of this idea if we assume a far future and if we assume the nature of reality to be incredibility complex akin to the existence of multi-verses. For we have seen already how living systems use quantum mechanical "which-path information" in photosynthesis (Quantum Biology), thus perhaps the conscious mind is quantum mechanical, as some like Roger Penrose have suggested, and perhaps in the far future, or even the not-so-far future, the pressures on human minds in the modern world to process so much information, and to process it so fast (a real world analogy again this time to the creation of the field of Quantum Computing) where the constraint is again resource limitations in time or memory, that the need to preserve form and information will again "push" or evolve processing this time into other universes that are part of a Quantum multi-verse as the ultimate form of memory and time-optimization especially given a Universe, as already noted, drifting toward decay via entropy and Dark Energy.

This dichotomy of systems intent on preserving structure juxtaposing those against the very same can be seen in the speculated structural hierarchies as pairs:

- "Nothing" vs Quantum Mechanics (zero-point vacuum energy - Heisenberg Uncertainty principle "virtual particles" and fundamental particles in standard model) (optimization in consistency and fecundity)
- Dark Energy vs Gravity (large-scale super cluster, galactic, solar, stellar, and planetary structures)
- Gravitational forces (ultimately Black Holes) vs Atomic and Electromagnetic forces (required for structures in chemistry and biology)
- Planets (environments of scarcity) vs cells (benefits of consolidation of resources)
- Threats over time vs genes (genetic diversity and distributed risks via variation of forms)
- Ecosystem scarcity of food or energy resources vs organisms (economy of scale, strength in numbers)
- Deeper scarcity from competition of organisms vs photosynthesis (time optimization via quantum biology)
- Threats from faster or more abundant organisms vs minds (optimization in time via memory)
- Extreme risks over time vs mental structures using distributed minds as agents (redundancy and resiliency, maximized use of memory space)

Thus, while the concept of a Universe that involves a “programmatic intent” may be so deeply anathema to modern discourse, one can see from the presented examples that this model or framework, where the objects and processes in our Universe are described via a simple programmatic principle of ensuring structural integrity, might yet be true.

If we extend this model to examine cosmological origins we arrive a fascinating theory or “definition of reality” albeit having travel down extensive philosophical and metaphysical assumptions.

The appearance or existence of the proposed structural hierarchy, while it does not prove by any means the existence of Plato's world of ideas, obviously intimates its existence. If we consider this hierarchy in the context of concept of multiverses, we arrive at an interesting analogy. In other words, while our Universe may appear to be an evolutionary sort of competition or struggle of structure attempting to ensure integrity and or organisms trying to survive, perhaps we have now the appearance of something beyond a single sort of reality of filtering, ranking, and consolidation. For if we consider the existence of multiverses, then perhaps, again in the context of our programmatic paradigm, we have discovered the existence of a repetitive “cycle.” In short, a Universe creating or originating Big Bang starts off our progression of hierarchies with matter moving to ideas in mind and ultimately to "code" in a holographic Plato world of forms or universals (perhaps mind even lies here entirely). In fact perhaps a key flaw in neuroscience or computer science is that a mind is not a “thing to be built,” akin to a CPU processor, but perhaps it is rather a place or a "tool to be used," again in our Plato world, as if in a hyperspace outside the physical Universe. In a timeless Universe of Platonic form one could even envision every action or thought or decision ever made perhaps utilizing a single logic gate that is literally Universal to all reality and since it exists outside of time (perhaps only its output via minds inhibits a physical Universe) then since it is not in a physical Universe it does has not have a physical queue of work ordered in time.

Examining deeper the progression of structural hierarchies, we can represent them also as a “hierarchy of change” from change in quantity, into rates, and into rates of rates etc... where even a human mind can be considered a true optimization of processing (calculations / time) as well as power conservation (energy / time) and space (skull size / body mass) and resiliency or complexity as the human brain is distributed and has its own very similar hierarchy of learning or memory, thus perhaps a fundamental scale is needed for “level of inherent resiliency” from a single item versus a quantity of items and robustness of physical structure in time and environment ultimately to perfect redundancy in holographic form and perfect existence as ideas in minds and/or in a Plato world or ultra-reality. We can again examine these key attributes and how they all promote structural integrity up the hierarchy cycle from scale metrics of quantity/abundance/fecundity to structures using (or repelling) fundamental forces with atomic forces and electromagnetic forces versus gravitational and dark energy forces. Then we "move up" to processes like photosynthesis utilizing optimizations of quantum biology in a realm of scarcity of energy and elemental resources. We have genomes utilizing attributes of variety or diversity in the combinations and permutations of available options to offset threat probabilities. Further up still we see optimizations to not only reduce risk but (logically equivalent) to increase performance for organisms (vs competitors). We then have minds with the aforementioned optimizations used to avoid "tigers in the grass" where competitors use faster minds or bodies or minds with more memory to outwit their opponents. We see optimizations of fecundity (even so much as human lifespans linked to optimize genome variation versus maximizing any individual unit’s age), and energy usage and optimizations of design (note the multiple uses of forms of the human body). Again we reach optimizations of structure as ideas and encoded concepts from visual memories to computer code to memes and knowledge and holographic code. Again we approach a potential redefinition point where perhaps the holographic paradigm is the true "end of the line. Thus perhaps holographic encoding can be redefined as "the maximum way to ensure the resiliency of a structure by storing the structure as an idea that literally is bits or “computer code” encoded in the very holographic nature of the boundary of space-time itself (see black hole thermodynamics and Bekenstein's Bound).

But now we must ask, if this holographic boundary is perhaps, or quite literally, Plato's world or ultra-reality, then might this boundary, or perhaps "that which is behind the boundary," be a reality where lie all structures or ideas, or all structures ever?

Let us follow this metaphysical leap to a possible logical end with some entertaining, if not beyond extreme, speculation. For again if we consider multiverses, perhaps every Universe again is just akin to a programmatic runtime that is run on or from within Plato's boundary reality. Have we potentially arrived at the true “basement” or foundation of reality? While a reality starting from “something versus nothing” may

not necessarily have all mathematics already in existence, akin to Max Tegmark's vision, perhaps we can rephrase "something versus nothing." Perhaps we have arrived at a "location" where primal definitions now inherently bootstrap existence? For all of the puzzles of induction, logic, theology, philosophy, math, cosmology, Quantum Mechanics, and physics hit "the wall" of the problem of infinity. But just as the very definition of "nothing" implies a "something," thus infinity (perhaps only actually existing in our Plato reality) cannot exist without its opposite. Thus perhaps we see the something versus nothing duality equivalent to "random versus non-random" sequences given the existence of non-infinite sequences (which by the very nature of infinity must exist as the bootstrapped dual or opposite).

From here, all begins. Now we may propose that in order to ensure the very nature of reality, then perhaps a "runtime" of every Universe must exist to instantiate (by definition) every non-random sequence ; a non-random sequence being equivalent to the very definition of structure!

Alas, perhaps we have arrived at a dreamlike "Definition of Reality" where:

> *"All possible (i.e. consistent and non-infinite) Universes (non-random physical structures -via a Big Bang type origin) MUST have a "runtime" (existence in physical reality) as it is required by the very definition of "something versus nothing" to thus define (to create/permit) a reality of something."*

This model is an "instantiation imperative" or dependency logically equivalent to stating "that which exists must be codeable and that which is encodeable must exist in at least one runtime of a Universe." And there are so many encoded structures possible so, since encoded structure cannot NOT exist, trillions and quadrillions of Big Bangs and Universes MUST occur or be "run" in order to literally suffice the simple bootstrapping definition of something versus nothing at our existential foundation. Our physical reality may be literally required to ensure the consistency of the core definition of something versus nothing. Of course we see the immense number of non-random sequences possible of particles or combinations and permutations of not just every particle but of every possible structure at every level of the structural hierarchy including living human beings like the author and reader. This number is gargantuan but nothing compared to infinity. Thus for every Universe that might have a possible lifespan until a complete heat death annihilation reverting back to literal nothing, we arrive at a label for each Universe itself that is the massive number for each that would represent the specific encoding or order of all of their total combinations and permutations or, in essence, we have arrived at the "name" of our Universe amongst all other Universe in a multiverse however impossible it would be most likely to calculate from within any given Universe itself. Perhaps we now even have a core definition of a Universe akin to "the minimum number of digits/bits needed to make enough structures to allow/permit/"last long enough for" structural hierarchies to be reached to reach the level of complexity to make a mind to perhaps allow the structures to become encoded in a the holographic paradigm." Thus a Universe is <u>required</u>, per the definition of reality, to suffice the definition of "something versus nothing" that <u>requires</u> the instantiations of every non-random sequence that by definition are structure.

Perhaps from this definition above all things start and all of existence can be subsumed logically. Thus the final metaphysical question of "why" there is "something versus nothing" likely becomes the final wall of knowledge.