

RENAMING THE UNIVERSE

*Or Why Our Life-Generating Universe Is
INHERENTLY
“GENERATROPIC”*

By
Jay B. Gaskill



Introduction:

When we observe the *outcomes* of evolution on the immense time scales of cosmology, an overall directionality becomes apparent, hinting at *purpose*. This observation always prompts a caution by skeptics. Their corrective rejoinders include:

When you imply purpose, you are anthropomorphizing are you not?

So what is the mechanism that drives this proposed progressive directionality?

How can you prove purposive activity or meaningful direction, when this putative pattern is the product of a series of random events?

But it was such a *huge* series of “random” events and such a *transparent* pattern. To any reasonable mind, at least on first impression, the overall pattern does suggest directionality. Given that circumstance, who has the burden of explanation? Questions as to the mechanism (in the second rejoinder) address possible tendencies that are effectively *invisible* at the smallest scales. Does that make the apprehension of an overall, large scale pattern unreasonable? And what exactly do we mean by *random*? What role, if any, could *micro*-random processes have in generating apparently non-random outcomes on the vastly larger scales?

Consider a survey of the overall pattern, from a God’s Eye perspective:

One infinitesimally tiny Singularity yields a “**Big Bang**” that in turn yields the rapid expansion of undifferentiated energy, followed by a pattern of emergence in which discrete interacting forms emerge from the undifferentiated flux:

Ω Emergence (see the discussion in Appendix A) takes place at varying rates, but physical cosmology posits the very early, very rapid appearance of energy and matter quanta, and the various fundamental forces, including gravity. As energy density drops, the light elements emerge, followed by their gravity-driven coalescence into proto-stars, the ignition of fusion processes inside the stellar formations, the proliferation of new stars that “self-organize” into galaxies, the generation of heavy elements, the coalescence of planetary bodies and so on.

Ω On at least one planet (endowed with what we now know to be pre-biotic conditions) new discrete forms emerge from the pre-biotic soup, becoming proto-cellular structures that eventually “learn” to reproduce themselves, then aggregate into organisms which in turn appear to “self-organize” into ecosystems. Once a critical mass is reached, a huge acceleration of development takes place. Collectively the explosion of biology is “Big Bang” II or the “**Bog Bang**”.

Ω Within the planetary ecosystem, animals emerge, and from that group, the faculty for conscious decision making develops, and from that, the entire suite of cognitive faculties emerges. The cognitive faculty list includes *foresight, empathy, reason, and creative innovation*. *Anima Mens-Sapiens** appears as the dominant species. The advent of cognition is huge: it inaugurates a third acceleration in innovation and development, “Big Bang III” or the “**Cog Bang**”.

* *This usage intentionally universalizes the otherwise parochial notion that the emergence of thinking, self conscious, rational, innovative beings will all (or only) belong to the genus “Homo”.*

Ω *Anima Mens-Sapiens* has appeared on the scene, as species of morally conscious beings with the capacity for reason and creative innovation whose mutual interactions in effect create social ecosystems. Within that developing milieu, there appear various competing models of social organization. These are the organizational technologies by which *Anima Mens-Sapiens* will optimize living conditions through regular patterns of cooperation. This development, taken as a whole, will be “Big Bang IV” or the “**Co-op Bang**”. The suite of social and economic interactions inaugurated by the “*Cog-Bang*” lead to the development of the social technology that we call *civilization*.

Civilization institutionalizes and intensifies the innovation and developmental tendencies of *Anima Mens-Sapiens*, facilitating and accelerating innovation even further, creating safe areas for peaceful human activities, developing new technologies for institutional memory (written language, for example), and beginning the formal narrative of the *Anima Mens-Sapiens* species’ history. For the first time, the contributions of moral, scientific and artistic genius are to be shared, remembered and studied for all time.

The Proposal: Our Universe is innately “Generatropic”

Précis: The “blind watchmaker” paradigm omits the impact of proto-intelligent systems that emerge in nature to supplement the “natural” selection process. “Blind” nature governs the challenge to a species of organisms, but not the response. Evolutionary development becomes less and less “blind”, as it is accelerated by incrementally “intelligent” selection processes. The emergence of proto-intelligence accelerates evolutionary development in bio-systems much like compound interest accelerates the return on an investment. *Think of a Lego piece as emblematic of a proto-intelligent multipurpose design element that can be utilized in several competing designs.* Once we can grasp how “natural” selection could “stumble” into the first Lego-like element, we can readily grasp how the evolutionary process is accelerated. The culmination of this process, inaugurating a profound speedup of creative innovation, was the arrival of conscious, reasoning bio-forms. This allowed millions of hypotheses and models to be sacrificed in lieu of whole species. The arrival of *Anima Mens-Sapiens* about 750k years ago (the design that is also a designer) was prefigured by the pre-arrival of proto-intelligence.

Proto-intelligent systems boost evolutionary development along lines favorable to bio-intelligence. The anthropic configuration of physical law made the universe “life-friendly”. This further boost can be seen as a predictable outcome of the anthropic alignment and justifies the assertion that the universe is “generatropic” (using *tropic* in the sense that plants, for example, exhibit light-seeking tropisms-Appendix B).

By the time evolution had generated a self-reproducing information storage device (i.e., the DNA information-packing, self-reproducing cell or cellular organism or cellular component of a colony of cells as part of larger organism) the stage was set for a series of accelerations in bio-evolutionary processes.

The DNA carrying cell is an obvious “Lego”. But the detection of proto-intelligence at the pre-cellular stages is more difficult. I note that some molecular structures are more “development friendly” than others. For example, recent research has explained the evolution of certain matching pairs of protein molecules that act as hormone and hormone receptors respectively -- “key and lock” for unique “modern” bio-regulatory functions -- were prefigured in a more generic receptor molecule 450 million years earlier. [Dr. Joseph Thornton, “Evolution of Hormone-Receptor Complexity by Molecular Exploitation”, *Science*, April 7, 2006¹] This sort of analysis can be regressed

¹ Science 7 April 2006:Vol. 312. no. 5770, pp. 97 --“Evolution of Hormone-Receptor Complexity by Molecular Exploitation” Jamie T. Bridgham, Sean M. Carroll, Joseph W. Thornton. “According to Darwinian theory, complexity evolves by a stepwise process of elaboration and optimization under natural selection. Biological systems composed of tightly integrated parts seem to challenge this view, because it is

indefinitely, all the way to the Big Bang. But the basic explanation still needs to include the underlying significance of a universe whose *organizational logic* leads to the gradual emergence of proto-intelligent modules.

In general, the operation of selection processes (think of semi-blind “choices”) that benefit the survival of any reproduction line will eventually experience a positive feedback. So we would expect to see a subtle, *innate* “evolutionary pressure” favoring innovations that fulfill the following two criteria:

- (a) no negative survival load;
- (b) utility as a multi-purpose adaptation socket (“plug in”) for more than one possible line of development, even in the absence of an immediate survival advantage.

We can expect the bio-form “strategies” that foster future adaptation flexibility will do better than the “all eggs in one basket” strategies. Otherwise the set of developments that eventually produced you and me, the information exchange in this and other mind-to-mind exchanges, could not have taken hold.

When we examine the large scale cosmological pattern (Big Bang to Big Civilization), played in fast-forward, the sense that we are observing something like a tropism is compelling. The emergence of proto-intelligence seems to lead directly to the emergence of the real thing. Random processes are involved, but it does not seem to be an *arbitrary* development. Why? Generative changes are taking place in a universe that allows randomness and indeterminate processes in the context of an overall governing order. Why?

A lot of keyboard strokes have been expended on the topic on the anthropic configuration of natural law. [I recommend Barrow & Tipler’s, “The Anthropic Cosmological Principle” and Michael J. Denton’s “Nature’s Destiny”]. But there has been little understanding of the crucial role of *randomness*. And there has been no serious attempt (so far as I can discern) to integrate Plato’s original insights about the a-temporal realm of form/order with the observed generative processes in nature. I believe that we are witnessing a stochastic generative tendency in nature that is linked to Plato’s non-material realm of form/design.

The anthropic discussion should be expanded. Random or indeterminate processes (sometimes described as chaotic indeterminacy) can readily be integrated into the overall picture once we allow that a *non-material realm of form-design* (think of the realm of Plato’s forms updated here to include dynamic form, the architecture of processes and systems, as well as the “pure” forms of Euclidean Geometry) exists *in a state of full, interactive co-existence with the realm of physical-materiality*, (the realm of space-time, particles, waves and energy). I refer to the former realm as Form Space and the latter as

not obvious how any element’s function can be selected for unless the partners with which it interacts are already present... Our results indicate that tight interactions can evolve by molecular exploitation—recruitment of an older molecule, previously constrained for a different role, into a new functional complex.”

Event space. [A more extended treatment of this idea is in my book-length MS, “The Ghosts Outside Plato’s Cave”.]

Latent design innovations resident in Form Space opportunistically slip through into Event Space, aided by random fluctuations that disturb the conservative tendencies of an otherwise rigidly deterministic regime. Generative processes utilize random disruptions that create a virtual grid that sorts for design elements. The grid is heuristic, becoming more and more “intelligent”. Seen in this context, evolutionary acceleration via emergence is probably affected by at least three clusters of factors:

- *Form/design adjacency* is the notion that, in a contemporary upgrade of Plato’s “Form Space”, similar “designs” are nestled along a solution continuum, with adjacencies that link to development pathways. Form/design adjacency posits design precursors coupled with optimal pathways to that design’s expression in Event Space. These pathways include “smart links”, i.e., potential evolutionary steps that (like a Lego piece) exhibit a generic capability to accommodate more than the design “plug in”. These “Lego” elements can be visualized as multi-design-friendly modules that, once emergent in Event Space, profoundly accelerate evolutionary development.
- *Increasingly “smart” natural selection filters*: (a) Given a steady stream of random variation, with occasional spikes, “smart filters” (operating as the natural selection process augmented by “self-training”) opportunistically generate spikes in development. (b) The proto-intelligence embedded on these filters (and their associated, but yet-to-be-fully-expressed designs), partly stored in Form Space (more on storage below), tends to emerge over time.
- *Subtle (and essentially undetectable) probabilistic effects converge* to accelerate the process. The directionality of evolution strongly implies minute probabilistic shifts that favor the opportunistic emergence of intelligence. [Whether this is an embedded “anthropic” feature of physical “law”, an emerging intelligent agency or an operating external one is a separate class of issues.] Sudden emergence of generative design can easily represent very tiny changes in effective probability over very long time frames. Suppose that unaided “blind” random processes in nature can yield an operating neuro-optical processing system in not less than 100 trillion years. To telescope this development time frame to 14.5 billion years would only require a *probability tweak* well below the detection threshold if it operated with a “compound interest effect”. That effect would be expected when the *tweak* favors development that facilitated further development. And the amplified cumulative probabilistic effect is strengthened when it couples with the design acceleration strategies sketched in the first two paragraphs above.

It is appropriate to posit a Genesis of All Beginnings in which a threshold “natural selection” event took place: Being was preferred against non-being, and the direction of all subsequent events was set.

This First Event inaugurated and revealed the generative principle. That principle or innate tendency gave birth to all form so far expressed in the universe and all that remains as yet unexpressed. From the realm of all form (the term is used here in an expanded sense), there emerged space-time as the venue for the expression of form/design in Event Space. The ongoing tension between form-order and random, order-disturbing processes in Event Space has allowed the generative principle continued scope of operation.

In the universe, we still observe the lingering effects of this pre-Big Bang in the persistence of a *stochastic creation* tendency. In this paradigm, our universe (possibly one of several) is an Event Space realm linked to Form Space in much the same way that various matter-energy phases are linked. The generative tendency can be understood as the outcome of the tension between infinite, latent, unexpressed form/design and the impossibility of its complete expression in Event Space within any finite temporal span. The generative principle continues to operate in the background, where it gradually promotes a sequential development path to unfold, resulting incrementally and eventually in the emergence of:

- ∞ Self-reproducing bio-form – *life*;
- ∞ Life’s greatest generative adaptation, *conscious, creative intelligence*;
- ∞ The support infrastructure for the foregoing, to wit:
→ *bio-ecology* and the organized *social ecology* that becomes *civilization*.

This view fits into a meta-reality model that explains and incorporates the random and indeterminate features of reality within the predominantly but not absolutely law driven realm of Event Space.

Our generation, equipped with the insights generated by computer and information science, is better able than the minds of Plato’s generation to understand how the realm of Form Space can encode all the features of the most complex *dynamic* processes, including the system designs of biology and the various developmental paths leading to their incremental development in the realm of Event Space (the space-time, energy-matter domain).

When creative innovation and ordering alignments seem to emerge in Event Space, our natural inclination is to ask ourselves, “Where did *that* come from?” The very notion of emergence (Appendix A) implies a “coming out” (or even a phase change), the uncovering of something that was hidden or latent. The metaphysical view that Form Space is linked to Event Space supplies a particularly powerful explanation for the emergence of novel design in the latter realm (since it was encoded within the former).

If we were to take seriously the materialist view of reality, the pre-Big Bang Singularity, as a sub-atomic quantum entity, somehow “encoded” all the form/design of physics, literally holding the pattern of every aspect of the forms that could emerge in the universe over time. Quantum physicists and cosmologists simply throw up their hands at this point. How *small* was this object? Were its boundaries less than Plank limit? If so, it would defy classical space-time physical description. Did it have boundaries *at all*?

The information storage density in the pre-Big Bang Singularity would be infinite in any meaningful sense of the term. If it *was* a geometrical point, *infinitely* small, then we have really passed out of the purely physical realm into Plato's territory. Any such a *Point would not be "locatable" in space-time at all; more properly understood, it would be a purely Platonic form.

Given the modern trend toward greater and greater information storage in smaller and smaller media, the idea of something approaching infinite information storage in a single point is possible to entertain. But the existence of a pure *geometric* point endowed with *infinite information storage* would necessarily represent an entirely different realm or domain of reality, one that the followers of Plato would recognize. All the available evidence (though incomplete) is consistent with that recognition. We may not yet be able to answer the question: How does the compressed and stored "Platonic" form/design "leak" from Form Space into Event Space? Observation trumps the "How" question: Over large time frames, it has; it continues to do so. This is why I've chosen the metaphor of a *phase* change to describe the transition from form to instantiation. Early science was able to discover the fact that steam, ice and water were phase changes of a single substance long before an adequate account of the mechanism was developed.

I propose that creative emergence occurs in Event Space where-and-when-ever that *Point is circumstantially located at an intersection of Form Space and Event Space. The Singularity that prefigured the Big Bang was one such *Point. Within the turbulence of Event Space, chaotic indeterminacy provides other such micro-intersections, offering the occasional opportunity for the emergence of novelty.

But not all novelty "takes". The survival and endurance of novelty depends on the robust character and situational relevance (or lack thereof) of the emergent design feature. Randomness operates as midwife in the processes of creative emergence; without random, indeterminate processes, the existing, law-driven order would otherwise have remained too rigid to accommodate creative change. We wouldn't be here.

The progressive overall pattern of evolutionary processes on the cosmic scale reflects the extraordinary potency of certain clever processes whose designs, once permitted to emerge, acquire a stubborn, self-replicating foothold in Event Space. When this is followed by self-replicating designs endowed with a heightened sensitivity to further creative emergence, the generative processes greatly accelerate. I see all these potent designs as stored in Form Space. Their opportunistic emergence is *effectively inevitable*, given sufficient time. This is why, given the immense resources of space-time in the current universe (and the inexhaustible reservoir of clever designs), random processes will eventually generate life forms and intelligence in any universe with a similar latent developmental architecture. See my article "2-B-or-Not" *The Designs of Intelligence* posted at: <http://www.jaygaskill.com/Designofintelligence.htm> .

We live in a universe governed in part by a generative principle or tendency. The generative principle as *creative tendency* emerges and takes root in the venue of

conscious intelligence as a primal motivation. As motivation, the creative tendency manifests in three forms:

- (a) The *Survival Imperative*;
- (b) The *Reproduction Imperative*, and (when our creative & imaginative capabilities reach critical mass);
- (c) The *Creation Imperative*.

In separate articles, I explain how these developments complete a circle, knitting together Descartes/Kant/Hume fact-value fissure, and opening the path to our species' rediscovery of its universal ethical foundations, and I connect this world view with a 21st century theology.

Appendix A

The Matter of Emergence and the Emergence of Matter

Emergence describes the development of novel complex entities from simpler ingredients. In human activity, the process is as familiar as bread making. In nature, the process is familiar in biological development, and somewhat less familiar in evolution.

Emergence typically is the process in physical reality whereby a particular novel organization, configuration or arrangement of elements or sub-systems can be said to represent a new existent not otherwise present in the (now) subordinate elements prior to the emerged novel organization, configuration, or arrangement. There are other definitions, but the idea closely parallels that of design, where the process is very clear. For example, the painting is a result of the artist's configuration of paint. The artist's vision is an emergent property of the paint configuration.

The central idea is that complex organization cannot be reduced to simplicity without destroying part of its essential nature. This statement is the same as saying that novelty exists. All novelty results from a combination or organization of existing simpler elements. For example, the constituent elements of a functioning toy wagon might be the contents of a bag of plastic parts; a complex organic molecule is composed of a large number of simpler atoms from as few as four chemical elements; a Bach fugue is constructed from a simple set of scales the individual note intervals of which represent discrete frequency relationships. To acknowledge that novel, complex organization is the result of the combination or recombination of less complexly organized elements is not the same thing as saying that reduction to the constituent elements preserves the complex order.

Organization adds a "something" to disorganized elements that was not present before. To watch the death and decomposition of a fellow creature is to see this principle, starkly,

in reverse operation. This lost “something” represents an additional level of organized complexity that was neither inherent nor necessary to the existence of the various disorganized constituent elements. In a word, it is novel.

The appearance of new order, seemingly a “mere” reordering of existing elements, is an instance of the emergence of novelty (and heightened overall organized complexity). Reductionism simply cannot account for this process. The miracle of existence is that novelty continues to emerge. Where does novelty come from? What is the mechanism for its emergence?

If, in nature, the new existent simply develops (here the metaphor of a photographic image, emerging in a pan of developing fluid, is helpful) we prefer to use the term of emergence, because there is no “designer.” For example, a group of birds suddenly acts in such a coordinated way that the flock becomes a sort of sky squadron. This dynamic organization is an emergent property of the interaction of the individual birds. In another example, scientists believe that the first multi-cellular animals were the emergent product of colonial organizational patterns of individual cells. In popular parlance, emergence is usually the explanation when “the sum is greater than the parts.”

In this view, a number of organizational or systemic properties or entities are seen to *emerge* in physical reality as the combinations and relationships among potentially constituent elements achieve a critical developmental stage. Emergence is the converse of reduction. But in physical reality, emergent entities and their reductions are not time reversible. Schrödinger’s cat may be poisoned, then reduced in a crucible to constituent elements, but the process cannot be reversed in real time. No one would seriously contend that the defining elements of *cat* are captured in the reduced description, ten ounces fur, etc.

Conscious intelligence itself can be understood as just such an emergent existent (either in the evolutionary context, as successive species developed the capacity to think and feel or in the biological development context, as an embryo progresses to baby, child and recalcitrant teenager).

Science is discovering that the relationships between physical “law” (or law-like tendencies) and the special properties of random / chaotic processes routinely lead to the emergence of novel organization in nature. This is a highly significant feature of the physical universe. And it suggests that the Darwinian description of evolutionary development, while valid as a narrow, physical description of the processes of biological evolution, is incomplete as a meta-theory.



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ENDNOTE

tro·pism (Greek)

1

a : involuntary orientation by an organism or one of its parts that involves turning or curving by movement or by differential growth and is a positive or negative response to a source of stimulation

b : a reflex reaction involving a tropism

2 : an innate tendency to react in a definite manner to stimuli; *broadly* : a natural inclination, a propensity.

- **tro·pis·tic**

Comment:

The most commonly understood tropism is phototropism, the tendency of plants to gradually turn in the direction of illumination (positive tropism); this is an adaptation that utilizes the light sensitive hormone *auxine*.

[Ref. <http://www.biologie.uni-hamburg.de/b-online/e32/32b.htm>.]

I would argue that tropisms in nature represent proto-intelligent, preconscious cognitive systems. They are the “stage one” information processing systems, the general form of which operates as the precursor from which the *generatropic* universe builds intelligence.

Mens = *mind*, understanding, reason (Latin)

Sapiens from **Sapient** = full of knowledge; wise; sagacious; discerning (Latin)

Anima = a living being, animal (Latin)

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