Vijay's Law: Everything in the Universe Is Alive and Conscious

Life and Consciousness as Fundamental Properties of Matter

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Abstract

This paper presents a theoretical framework addressing two foundational questions in science and philosophy that remain unresolved in their deepest form: what is life, and what is consciousness? It also addresses the deeper question of where consciousness comes from. These questions are often treated as separate problems. This paper treats them together, because they arise from the same underlying principle.

This paper advances the following law-level proposition: everything in the universe - every particle, atom, molecule, cell, and complex organism - is alive and conscious. Consciousness is not a late accidental product of neural complexity but a fundamental property of all matter, expressed differently at different scales and under different conditions of stability, but never absent. What

physics describes as forces and interactions are the elementary expressions of consciousness or its effects at the atomic and subatomic scale. The argument proceeds through multiple independent lines of reasoning: the logical impossibility of deriving living from non-living matter without the property being latent in components; the observable evidence of cellular behaviour following organismic death; the documented behaviour of colonial organisms such as siphonophores; and the experimental findings of Michael Levin on Xenobots and Anthrobots [1, 2]. A central prediction, that consciousness is suspended but not destroyed during periods of unpredictable change in matter and resumes expression when stability is restored, is presented as a falsifiable, scale-dependent claim.

The implications of this framework for biological evolution are substantial, but the dedicated argument is reserved for the next paper [85], which examines evolution through conscious drive as the lineage-level expression of the same underlying drive toward perpetuation.

Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

The paper further demonstrates that the standard invocation of emergence as an explanation for consciousness is not merely incomplete but carries an unacknowledged quantification burden that renders it scientifically untenable. Emergence is commonly treated as a single philosophical claim about how consciousness came to exist. In fact, if emergence is the mechanism, it must be operating now, continuously, across every fertilised egg, every germinating seed, every dividing cell - producing not one uniform type of consciousness but qualitatively distinct forms, each with a different sensory architecture and a different mode of world-construction, amounting in a human body alone to approximately 37 trillion cellular consciousness events of different types running simultaneously. The emergence account is therefore committed not to one unexplained mechanism but to an effectively infinite catalogue of distinct unexplained mechanisms operating without interruption and without any identified source. The latency view requires none of this inventory: one principle, present in all matter from the beginning, expressed differently at each scale and in each organisational form.

The paper also includes a minimal Monte Carlo Perpetuation Simulation showing that under repeated disturbance, the standard inert/no-drive model trends toward collapse while the Vijay's Law condition remains robustly stable across scaling conditions, with supplementary appendices and code deposit materials provided for reproducibility.

In addition, simple local-rule pattern-formation simulations are presented to show that coherent natural-looking large-scale forms can emerge from decentralised local perpetuation-like behaviour without any globally pre-coded target geometry.

Two subsequent papers in this programme give the qualitative claims of this paper a quantitative physical grounding that was not yet available at the time of writing. Paper 20 [103] identifies the four fundamental forces of physics as a hierarchical structure of physical sensing channels, directly

extending the elementary-consciousness argument developed in Section 6 below. Paper 21 [104] introduces the Consciousness Index, a scalar measure built on that same hierarchy, and applies it across a wide range of biological systems. Section 6.2 of the present paper summarises this connection.

Keywords: universal consciousness; Vijay's Law; life and matter; perpetuation drive; latency principle; cellular consciousness; panpsychism; hard problem of consciousness; plant intelligence; siphonophores; Xenobots; Michael Levin

Introduction

Two of the deepest unresolved questions in science and philosophy are these: What is life? And what is consciousness, and where does consciousness come from? These questions are almost always treated as separate problems belonging to separate disciplines. This paper treats them together, because they arise from the same underlying principle.

The question of what life is has been treated as essentially solved by biology. The standard definition, that living things are characterised by metabolism, reproduction, homeostasis, growth, response to stimuli, and adaptation, is taught as settled science. But this definition fails on its own terms. A seed in dormancy has no metabolism, does not reproduce, does not respond to stimuli, and shows no growth, yet no biologist would say a seed is not alive. A virus has no metabolism of its own and cannot reproduce without a host cell, yet it behaves with extraordinary strategic precision. A mule cannot reproduce at all. The definition describes a cluster of properties that living things typically possess, without identifying what life itself is or where it comes from. This paper provides that identification.

The question of what consciousness is has produced the so-called hard problem of how subjective experience arises from physical processes, which has resisted resolution for decades. Every prior framework either confines consciousness to brains, or invokes emergence without explaining its mechanism. To invoke emergence without identifying the source of the property that emerges is to postpone instead of solve the explanatory problem. This paper advances the position that consciousness is not a product of complexity. It is fundamental to matter itself.

The implications of this framework for the true mechanism of biological evolution are profound, but that argument is developed separately. This paper confines itself to the prior question, whether life and consciousness are fundamental to matter instead of late emergent accidents.

Both questions addressed here have the same answer. Life is the expression of consciousness in matter under stable conditions. Consciousness is fundamental to matter, present at every scale, from particle to organism. This paper addresses the first proposition of Vijay's Law, that everything in the universe is alive and conscious, grounded in the companion cosmological framework BFUT [81], which establishes that matter emerges from a living, conscious primordial field and provides the foundational basis on which the present argument rests. The evolutionary implications of this law are developed in the next paper [85]. The remaining propositions of Vijay's Law and their extension into human emotional and experiential life are developed in later work.

A further methodological clarification is also necessary at the outset. Much of modern science mistakes reductionist description for ontological negation. Once a phenomenon is redescribed in the language of force, signalling, regulation, excitation, inhibition, or quantifiable process, it is often assumed that consciousness has thereby been removed from it. This paper argues that no such conclusion follows. A phenomenon may be described in mechanistic or even fully formal quantitative terms without ceasing to be conscious. The same point extends, in the author's broader framework, to human emotional life as well. The detailed emotional framework is under patent protection and is therefore not discussed here.

A clarificatory note on positioning within the broader literature is warranted. The claim that consciousness is fundamental to matter instead of an emergent product of neural complexity overlaps, in its general orientation, with positions developed by other theorists. Chalmers' formulation of the hard problem of consciousness identifies the explanatory gap this paper addresses [87]. Strawson's argument for realistic physicalism concludes that experience must be fundamental to matter if physicalism is to avoid incoherence [88]. Goff has developed a detailed philosophical case for panpsychism along related lines [89]. Tononi's Integrated Information Theory (IIT) proposes a formal measure of consciousness grounded in informational structure instead of substrate, extending in principle to any sufficiently integrated system [90]. The present framework was developed independently of these traditions and differs from each in specific respects. Unlike IIT, it does not ground consciousness in integrated information as a threshold quantity, but treats the perpetuation drive as its defining characteristic at every scale, including below any threshold of integration. Unlike Strawson and Goff, it does not restrict itself to a philosophical argument from the coherence of physicalism, but grounds the claim in a material continuity chain, in empirical biological evidence, and in a companion cosmological framework. The convergence of independent lines of reasoning toward the same broad conclusion strengthens instead of weakens each. The physical grounding of the present claim is completed in BFUT Papers 20 and 21 [P20, P21], which derive the Hierarchical Channel Accessibility framework from the Spaticle field interaction channels and introduce the Consciousness Index (CI) as a universal, physically grounded scalar measure. Unlike phi, CI has a strictly positive floor - no physical system with mass scores zero - which is the quantitative expression of the central claim of this paper. CI is derived from the same physical substrate that grounds the rest of the BFUT programme, making it the first consciousness measure whose floor condition is a physical necessity instead of a definitional choice.

The Monte Carlo Perpetuation Simulation introduced in this paper is deliberately minimal and scale-invariant. It does not model biology specifically, but tests whether collections of units under repeated disturbance can sustain high-order stability when treated as purely inert versus when given a minimal perpetuation term. This makes it relevant not only to Layer 2, but also to Layer 1 and Layer 3, because it isolates the core logic of Vijay's Law in abstract form. The physical mechanism connecting the Spaticle field to consciousness through sensing channels, and its quantitative expression as a universal scalar measure applicable to every physical system from

viruses to humans, are established in BFUT Papers 20 and 21 [P20, P21], which complete the bridge from the cosmological substrate of Layer 1 to the measurable, graded conscious degree that Vijay's Law requires.

1. The Central Claim

The central law proposed here is not probabilistic or metaphorical. It is universal in scope: everything in the universe is alive and conscious. All matter has an innate drive to perpetuate itself, either in its own form or in cooperation with other matter to produce more complex forms. When matter participates in such higher forms, its drive to perpetuate itself is fulfilled if the combined form can perpetuate itself. Whenever conditions are stable or predictably unstable at any scale in the universe, matter will manifest accordingly. The argument of this paper is that this law is literally true, not merely heuristically useful. What physics describes as forces are the elementary expressions of consciousness at the most fundamental scales. What biology describes as life, awareness, and drive are the same phenomenon expressed at higher scales of complexity and organisation.

Consciousness, as defined in this framework, includes awareness of position and surroundings; the capacity to respond to other matter; the capacity for attachment and bonding; and, most fundamentally, the drive to perpetuate self, either in one's own form or through contribution to a higher form that carries the matter forward. This is a functional definition. It does not require subjective experience in the human sense at every level, but it does claim that the precursors and elementary expressions of all properties associated with consciousness at the human level are present, in latent or expressed form, at every level of matter. The distinction from mere chemical reactivity is the presence of the perpetuation drive as an orienting principle, not merely a side effect of interaction. A clarification is necessary here. This definition might appear to admit artefacts such as a thermostat, which responds to temperature and maintains a set point. It does not. The perpetuation drive, as used in this framework, must be intrinsic to the matter itself - arising from within the entity, not assigned to it from outside by an external designer. A thermostat has no investment in its own continuation. Its target state is imposed by a human being who set it, and if it is switched off or dismantled, nothing in the thermostat resists or responds to that. The atoms of which the thermostat is composed retain their latent participation in the universal substrate, but the thermostat as a constructed instrument is not a conscious entity in the relevant sense because the organising principle of its behaviour originates entirely outside it. A bacterium, by contrast, generates its own drive from within. No external agent assigned its survival instinct or its replication target. That is the line the definition draws: intrinsic perpetuation drive, not externally delegated goal-execution.

2. The Foundational Logical Argument: The Latency Principle

The argument for the latency principle rests on three independent lines of reasoning, each of which is developed in the subsections that follow. The first concerns what the most reliable marker of life actually is, and what that reveals about the matter in which life is said to reside. The second concerns the elemental composition of living beings and what follows from the fact that their

constituent elements are chemically identical to those found in non-living matter. The third, developed formally in Section 2.3, traces the material continuity from hydrogen to human within a closed system and derives what must follow about the latency of life and consciousness in matter. Anchoring the progression in a deeper substrate such as the spaticle field, as established in the companion BFUT framework [81], extends this continuity further, to the foundational field of reality itself - from which primordial hydrogen emerges, through stellar nucleosynthesis to heavier elements, and from those elements to increasingly complex living systems. At no stage in this chain is any external principle inserted. No new category of matter appears. The progression is materially continuous throughout.

This continuity is reinforced at the subatomic level. The protons, neutrons, and electrons that make up a carbon atom in a human neuron are not fundamentally different in kind from those that made up the earliest hydrogen atoms. The periodic table does not represent the appearance of new fundamental matter. It represents new arrangements, quantities, energy states, and relational structures of the same underlying building blocks. If the same particles, merely differently organised, eventually constitute a conscious living being, the question of when and how life and consciousness enter the chain cannot be dismissed. It must be answered. The sections that follow provide that answer.

2.1 Movement as the Most Reliable Marker of Life

Many criteria are often proposed. Breathing is one. But not all living systems breathe in the ordinary sense. Consumption of water is another. But not all organisms “drink” in any recognisable way. Dependence on oxygen is often assumed, yet anaerobic organisms exist. Metabolism is commonly invoked, but the term itself becomes difficult to apply consistently across edge cases such as dormant states, spores, or radically simplified biological forms. Reproduction is another popular criterion, yet many unquestionably living individuals do not reproduce, cannot reproduce, or are between reproductive phases. Growth, sensation, responsiveness, and other markers all have similar limitations when treated as universal definitions.

What then remains as the most intuitive and reliable sign?

Movement.

If something moves by its own internal power, and continues to do so persistently instead of as a result of a single external push, human beings almost instinctively classify it as alive. Across ordinary experience on Earth, self-generated movement remains the most compelling and immediate marker of life.

To make the point vivid, imagine the following. A holy man claims that he can make any object come alive. A plate is selected. He waves his hand over it, and the plate begins to move.

Naturally, the first assumption is fraud: hidden wires, magnets, trickery, or some concealed mechanism. So the plate is taken away, broken into pieces, and examined. Nothing is found. The fragments are removed from the holy man entirely and kept under independent observation. Yet every fragment continues to move.

The observer is then given a full year to test the claim. The fragments are heated, frozen, buried, deprived of oxygen, deprived of water, deprived of sunlight, and subjected to every hostile condition that would destroy known organisms. Yet they continue to move.

At the end of that year, most observers would say the same thing: whatever these fragments are, they are alive. Not because they have been shown to eat, reproduce, breathe, or metabolise in any conventional sense, but because they exhibit the one property that most powerfully compels the judgement of life: persistent self-generated movement.

Now comes the deeper point. Before the holy man ever waved his hand, the plate was already made of atoms. Within those atoms, electrons were already in motion. That motion did not begin after the declaration of life. It was already present. Breaking the plate did not stop it. Heating it did not stop it. Cooling it did not stop it. The matter was never truly inert in the absolute sense implied by ordinary language.

So the difference between what is called alive and what is called non-living is not simply the presence or absence of movement. Both possess movement. The difference is that in one case the movement becomes visible, organised, and dramatic at a scale that compels human recognition.

Physics describes atomic and subatomic motion through force, charge, and quantum structure. That explains the mechanism. But it does not settle the deeper ontological question. If persistent organised movement is the most reliable sign by which human beings recognise life, then the fact that matter is already in ceaseless internal motion strongly supports the view that matter is not dead in any absolute sense. Rather, what appears at biological scales as life and consciousness may be a richer, more integrated, and more stable expression of a continuity already present in matter itself.

2.2 Elemental Continuity and the Problem of Life's Origin

But that escape route is blocked if the elemental lineage is traced back to a single dominant precursor: hydrogen.

If the early universe had begun with a wide variety of complex elements, consciousness could always be attributed to some special emergent chemistry arising only from the interaction of fundamentally different ingredients. One could always argue that life appears only because of some rare and irreducible combination among many unlike materials.

Oxygen, carbon, hydrogen, nitrogen, calcium, phosphorus, potassium, sulphur, sodium, chlorine, magnesium, iron, zinc, silicon, copper, iodine, selenium, fluorine, manganese, molybdenum, cobalt, chromium, tin, vanadium, and nickel.

At first glance, they appear to be nothing more than ordinary chemical elements. They are found in air, water, soil, rocks, oceans, stars, metals, minerals, and manufactured objects. The carbon in this list may be found in coal or graphite. The oxygen may be found in air or water. The iron may be found in rock, soil, or steel. The sodium and chlorine may be found in salt. The silicon may be found in sand or glass. The same elements exist throughout the universe in what we routinely classify as non-living matter.

And yet these are also, in broadly accepted biological terms, the principal elements that make up the human body.

That fact creates a direct philosophical and scientific problem. If the very same ordinary elements exist outside the body in forms called non-living, but inside the body together constitute a conscious, living human being, then one must ask: at what exact point do they become alive? At what exact point does consciousness enter? If the elements themselves are fundamentally non-living, then where does life come from? What is the precise moment at which dead matter becomes living matter, and by what mechanism does that transition occur?

This paper advances a different answer. It argues that the problem arises only because the starting assumption is wrong. The correct inference is not that life is mysteriously inserted into otherwise dead matter at some later stage of organisation. The correct inference is that the capacity for life and consciousness is already present in matter from the beginning, and becomes progressively expressed as matter enters more complex and coordinated forms.

In that sense, the ordinary elements of chemistry are not exceptions waiting to be transformed by some external spark. They are already participants in the continuity of life. Their later organisation into cells, tissues, organs, and conscious beings does not create life out of nothing. It reveals, amplifies, and coordinates a property already latent within them.

This is the first central claim of Vijay's Law: everything in the universe is alive and conscious, and what changes across scales is not the presence or absence of that underlying reality, but the degree, form, stability, and integration of its expression.

2.3 Hydrogen to Human Continuity and the Elimination of the Material Escape Route

The argument becomes stronger when the material history of the human being is traced backward to the earliest atomic anchor: hydrogen, the simplest, the earliest atom. This is not a claim that hydrogen was the first thing that existed in an absolute sense - the deeper substrate is the spaticle field - but at the atomic level, hydrogen is the cleanest starting point for the continuity analysis. The human body is made entirely of matter that can be traced backward through organs, tissues, cells, molecular systems, and atomic structures to hydrogen-derived states. It is not ordinary matter plus some separately inserted life-substance. It is a reorganised continuity of one material history. This immediately creates a hard restriction: if the universe is a closed material process, nothing relevant to life or consciousness can be inserted from outside the chain at any later stage. Whatever is required for human life and consciousness must have been present in latent, graded, or less expressed form from the beginning.

2.3.1 The Continuity Chain: Formal Statement

Let the hydrogen-to-human sequence be represented as:

$S_0 \rightarrow S_1 \rightarrow S_2 \rightarrow \cdots \rightarrow S_{\square}$

where:

- S_0 = hydrogen, the simplest, the earliest atom
- S_1 = heavier atomic forms produced through later transformations
- S_2 = simple molecular systems
- S_3 = complex molecular systems
- S_4 = higher-order chemical assemblies
- S_5 = proto-biological organisations
- S_6 = cells
- S_7 = multicellular organisations
- S_8 = tissues
- S_9 = organs
- S_{10} = organisms
- $S_{\square}$ = humans

Each later stage is not a fresh ontological creation. It is a lawful transformation of prior matter:

$S_{i+1} = T_i(S_i)$

where T_i is a physical transformation such as fusion, chemical bonding, structural assembly, differentiation, integration, or higher-order organisation.

The exact intermediate chemistry is not the main point here. The main point is continuity. If the later stage is made from transformed earlier matter, then the later stage is materially descended from the earlier stage. If the energy involved is internally transformed instead of externally injected as a new ontological category, then the later stage is not receiving some hidden life-bearing substance from outside. It is reorganising what already exists.

Formally, the transition obeys a closure condition:

$M(S_{i+1}) \subseteq \Phi(M(S_i), E_i)$

where:

• $M(S_i)$ is the matter content of stage S_i

• E_i is the energy available within the transformation

• Φ is the lawful transformation space available to that matter-energy state

This means the later stage must arise from prior-stage matter under internally available energy and lawful transformation. It cannot depend on a new unaccounted ontological ingredient entering the chain.

2.3.2 The Ontological Injection Problem

Humans undeniably exhibit life and consciousness. That much is not in dispute.

But humans are made entirely of matter. That matter is not alien to the rest of the universe. It is not imported from a separate metaphysical reservoir. It is the same matter, reorganised through successive stages.

So if the human at the end of the chain is alive and conscious, then one of only two broad possibilities is available:

1. Life and consciousness were already present in latent, graded, or less expressed form throughout the chain, or

2. At some later stage, a genuinely new ontological property was inserted into the chain

The first option preserves continuity.

The second option is the hidden burden carried by conventional emergence claims, even when that burden is disguised with softer language.

2.3.3 Why "Something Else Entered Later" Fails

Let P denote the relevant property:

$P \in \{\text{life, consciousness}\}$

The discontinuous view requires some stage k such that:

$P(S_{k-1}) = 0,\ P(S_k) = 1$

That is, the property is truly absent before stage k, and truly present after stage k.

But if:

• matter is continuous,

• energy is continuous,

• the transformation is lawful,

• and no external ontological input is allowed,

then a genuine discontinuous appearance of P requires an extra term:

$P(S_n) = f(S_{n-1}) + \varepsilon$

where:

$\varepsilon \neq 0$

and ε is not merely reorganisation, scale, or increased observability. It is a genuinely new ontological contribution.

That is the hidden term almost every standard emergence argument relies on without naming it.

If ε is real, then it must be one of the following:

1. It comes from outside the chain

2. It appears from nowhere inside the chain

3. It was already latent in the prior chain and became newly expressed

The first violates closure.

The second is creation ex nihilo in different language.

The third is precisely the latency claim advanced in this paper.

Therefore the only scientifically coherent surviving conclusion is:

$\varepsilon = 0$

And if ε = 0, then the property was never truly absent. It was only less expressed, less organised, or less detectable at earlier stages.

Thus the more coherent form is:

$P(S_i) > 0$ for all i

with variation not in existence, but in:

• degree,

• organisation,

• integration,

• complexity,

• and observability.

2.3.4 The Boundary Burden Argument

A common hidden rescue route is to assume that perhaps some decisive ingredient entered later: some special field, some special substance, some special consciousness-bearing condition, some unknown life principle, or some other physically relevant factor not present in the earlier chain.

That route fails if the universe is treated as a closed transformation process. If something physically relevant could enter later from "outside," then that outside is not merely conceptual. It is a physically operative boundary condition. It must interact with the system. If it interacts, it has physical consequences. It cannot be invoked only when convenient and ignored everywhere else. Any physically real outside must impose causal, pressure, or boundary relations with the system it borders. Specifying such a boundary immediately generates an infinite regress: the boundary itself requires an account of what confines it, what stabilises it, and how it remains coherent while remaining causally operative over cosmological scales. The fuller derivation of this boundary burden is developed in the companion BFUT framework [81]. For present purposes, the logical point suffices: the "something came in later from outside" intuition is not a simple rescue. It immediately creates a far larger physical and ontological burden than it solves.

2.3.5 The Universe as a Closed Transformation Experiment

The cleaner inference is therefore direct.

The relevant matter remains within one continuous material history.

Transformations occur internally.

Energy is redistributed internally.

Structure changes.

Complexity increases.

Organisation deepens.

Observability of certain properties changes.

But no scientifically defensible external ontological ingredient enters later to solve the life problem.

2.3.6 The Hydrogen to Human Conclusion

In that sense, the universe functions here as a closed transformation experiment.

Hydrogen is not merely one early ingredient among many. At the atomic level of the argument, hydrogen is the simplest, the earliest atom, and therefore the cleanest anchor for the continuity proof. Once that anchor is fixed, the rest of the material chain is constrained.

If the endpoint of that chain is a human being who undeniably exhibits life and consciousness, then the burden is not on the continuity view to explain how life got in. The burden is on the discontinuity view to identify the exact stage at which a genuinely absent property became truly

present without importing magic, without violating closure, and without smuggling in an unnamed ontological term.

One further point must be made about the hydrogen-to-human argument that is often overlooked. When this framework treats human consciousness as the endpoint of a closed material chain, the human is serving only as the clearest and most familiar example. It is not the only case. The discontinuity view does not face the hydrogen-to-human problem once. It faces it an uncountable number of times, every day, across the entire biosphere. Every fertilised egg that develops into an organism, every seed that germinates, every spore that activates, every embryo that differentiates - each one is, on the emergence account, a fresh instance of consciousness arriving from non-conscious matter. Not historically. Now. Continuously. And not one uniform type of consciousness arriving each time, but qualitatively distinct forms: the echolocation-consciousness of a developing bat, the sixteen-channel colour-consciousness of a hatching mantis shrimp, the distributed arm-consciousness of a growing octopus, the electroreceptive field-consciousness of a fish, the chemical-gradient consciousness of a bacterium dividing in a soil particle. Each of these is categorically different in its architecture, its sensory range, its mode of world-construction. On the emergence account, each requires its own mechanism, its own threshold, its own injection event. Furthermore, an adult human body contains approximately 37 trillion cells, and the Xenobot and Anthrobot experiments demonstrate that each cell possesses its own individual drive and problem-solving capacity. Each of those cells is itself, on the emergence account, a separate consciousness event of a different type from the organism-level consciousness it contributes to. Multiply the types by the instances, multiply the instances by the organisms alive at this moment, and the emergence account is committed not to one unexplained mechanism but to an effectively infinite catalogue of distinct unexplained mechanisms operating simultaneously, reliably, and without any identified source. The latency view requires none of this. One principle, present in all matter from the beginning, expressed differently at each scale and in each organisational form. The variation across species and cell types is not a problem to be explained. It is exactly what the latency principle predicts.

2.4 The Composition Argument

The human body is composed entirely of elements, carbon, hydrogen, oxygen, nitrogen, iron, calcium, and others, that are chemically and physically identical to those found in non-living matter. The iron in human blood is identical to the iron in rock. The carbon in a human cell is identical to the carbon in coal. There is no special biological version of these elements.

This creates a fundamental logical problem for the conventional view. If these elements are truly non-living and non-conscious in themselves, then either living beings can be created from genuinely non-living components, which means life arises from nothing and is logically equivalent to creation ex nihilo, or the elements themselves must possess the properties of life and consciousness in latent form. The conventional account invokes emergence: life is said to be an emergent property of complex arrangements of matter. Emergence, as commonly invoked in this context, is a descriptive label for the appearance of higher-order properties, not a causal account of their origin. To say that life or consciousness emerges from non-living matter without showing how the defining property was already latent is not an explanation but a restatement of the phenomenon. Unless the relevant

property is already present in latent form, emergence here functions as a renaming of ontological discontinuity. In this sense, standard emergence accounts do not solve the problem of life or consciousness. They postpone it. The latency argument provides a mechanism where emergence provides only a name: the properties were always there, expressed differently at different scales.

Stated more precisely, if life or consciousness are truly absent in the constituents yet fully present in the whole, the theory requires an ontological discontinuity: a real property appearing without prior presence in any form. That is not a scientific explanation. It is a disguised miracle.

2.5 The Latency Analogy: Human Emotional Capacity

Consider a man who has never experienced romantic love, not because the capacity is absent, but because the conditions have not arisen. When he meets a person of the right kind in the right circumstances, he experiences love. The capacity was latent all along. The encounter did not create it; it triggered its expression. Calling love an emergent property misidentifies what actually happened: the property was always there, encoded in his biology, chemistry, and neural architecture.

Furthermore, consider a man from a peaceful background who becomes a serial killer decades into a previously normal life. No scientist examining him beforehand could have detected the latent tendency, not because it was absent, but because the instruments and frameworks were inadequate and the triggering conditions had not yet arisen. This is the epistemological situation with consciousness in atoms: current instruments are built around the assumption that atoms are non-conscious and are therefore not designed to detect what consciousness in an atom would look like.

The Minnesota Study of Twins Reared Apart, published in Science in 1990 by Bouchard and colleagues, covering 137 pairs of identical twins raised in entirely separate families with no shared environment, found that twins reared apart showed similarities in behaviour, personality, interests, and social attitudes statistically indistinguishable from identical twins raised together [91].

The conventional account typically responds by arguing that shared genes produce similar brain chemistry, similar brain chemistry produces similar behavioural tendencies, and environment merely triggers what was biochemically inevitable. This is accepted. But notice what this concession actually says. It says that the human being - the person who believes he is making choices, directing his life, deciding whom to love and what to pursue - is not the author of those decisions. His cells are. The behavioural convergence across two entirely separate lives was not directed by the conscious human. It was encoded in every cell of both bodies at the moment of conception, expressed through decades of apparently independent living and observed in striking similarity despite separate upbringing. The human was the vehicle. The cells were the living agents executing a programme written into their own nature before the human's first conscious thought.

This is not a weakness in the latency argument. It is its strongest confirmation. The real living beings inside a human body are the cells. The human form itself is the shape those cells have collectively chosen as their most effective strategy for perpetuation. What appears to be a person

making decisions is, at the deeper level, trillions of conscious entities executing their own drive - through the instrument they built.

2.6 The Epistemological Limitation Argument

The absence of detected traces of consciousness in isolated atoms does not establish their absence. Absence of evidence is not evidence of absence, particularly when instruments of detection were designed around a different theoretical framework. Physics observes atoms in isolated or simple-combination states, analogous to observing an undifferentiated embryonic cell and concluding that this is everything the cell is and does, ignoring that the same cell, in different positions within a developing organism, becomes a photoreceptor, a neuron, or a bone cell.

The distinction between latency and emergence is worth stating precisely, because the two positions are sometimes conflated. The emergence view holds that life and consciousness appear only after sufficient complexity is reached, but leaves the source of the new property unexplained. It describes the observation without providing the mechanism. The latency view, advanced here, holds that the capacity for life and consciousness is already present in matter and becomes expressed - not created - when the relevant conditions, combinations, and scales of stability are reached. On the emergence view, something genuinely new appears at a threshold. On the latency view, nothing genuinely new appears: what changes is the degree, organisation, integration, and observability of a property that was always there. The practical difference matters for scientific methodology: the emergence view predicts a sharp boundary between living and non-living matter, which has never been found. The latency view predicts a continuum of graded expression, which is precisely what the biological evidence repeatedly shows. The section that follows moves from this logical and chemical argument to a direct biological demonstration of the same principle, showing that the continuum of expression is not merely a theoretical prediction but an observable fact at the cellular level within every living body.

3. The Cell Differentiation Argument

Every human being begins as a single cell carrying identical DNA. Yet some cells become photoreceptors capable of detecting light. Some become neurons firing electrochemical signals. Some become deep bone cells apparently without sensory function. All carry exactly the same genetic information.

If the bone cell lacks consciousness and sensory capability while the eye cell has them, but both cells are genetically identical, where did the eye cell's consciousness come from? The conventional answer, differential gene expression triggered by positional signals, is precisely the latency argument stated in biological language: the capability was present in both cells all along. Context determined which capabilities were expressed, not which capabilities existed.

This principle applies at every scale. The cell has individual consciousness. When cells combine into an organ, a new level of consciousness emerges, and the organ develops collective awareness oriented toward its function while each cell retains its individual consciousness. When organs combine into a complete organism, a further level emerges, the organism's unified awareness, while

each organ and cell retains its own. A human being may therefore be understood not as a single indivisible living unit, but as a highly coordinated alliance of trillions of living and conscious cellular participants. The visible human self is the macro-level vehicle or interface of that alliance, while the deeper operational intelligence resides in the cellular collective that builds, maintains, repairs, and continuously regulates the body from below. During a human lifetime, vast numbers of cells are continually replaced, yet the organism-level identity persists. This is exactly what one would expect if the higher-order human consciousness is a coordinated collective expression arising from a deeper, ongoing society of cellular agents. Death is the breaking of the connection between individual cellular consciousness and the collective body consciousness. The cells themselves do not all die at that moment. They continue to live for a time, as organ transplantation and post-mortem cell biology confirm, but the collective organism-level consciousness dissolves.

4. The Siphonophore Evidence: Macro-Scale Confirmation

Siphonophores, colonial marine organisms including the Portuguese man o' war, provide a directly observable, macro-scale demonstration of the principle operating at the cellular level in human bodies. A siphonophore is a colony of individual zooids, each genetically identical, each theoretically capable of independent existence, but each specialised into a dedicated function, locomotion, feeding, reproduction, or defence. The colony behaves as a unified organism while composed of individuals that have subordinated their independent function to the collective. [37]

This is not merely metaphorically similar to what happens in human cellular organisation. It is logically identical at a scale visible to direct observation. If zooids are separated from the colony, they attempt to resume independent function and seek new combinations, exactly as isolated human cells behave following organism death, and exactly as Levin's experimental cells behaved when removed from their developmental context [1, 2].

5. The Levin Xenobot Experiments: What Was Observed, What Was Not Explained, and What This Framework Predicts

5.1 What the Researchers Found

In 2020, Kriegman, Blackiston, Levin, and Bongard published a landmark study in PNAS reporting on novel living constructs later called Xenobots, built from embryonic Xenopus laevis cells [1]. The crucial observation was not that researchers inserted a new genetic program. They removed embryonic frog cells from their normal developmental context, placed them in a Petri dish in a new physical environment, and found that the cells did not simply remain inert or remain confined to their expected developmental role. Instead, they reassembled into new multicellular configurations. These constructs moved autonomously, displayed coordinated group behaviour, and could self-repair when damaged [1, 2]. In later work, the same research programme showed that such reconfigured cell collectives could also exhibit kinematic self-replication by gathering loose cells in their surroundings into clusters that matured into new Xenobot-like offspring [78]. More recently, Levin's lab produced Anthrobots from human lung cells with similar collective properties [82], and subsequent transcriptomic analysis reported that cells freed from organismal influence show

distinctive upregulation of evolutionarily ancient systems and greater inter-individual variability in gene expression than age-matched embryos, consistent with a broader range of transcriptional states [7]. The central fact is therefore striking: once freed from their original organismal assignment, embryonic frog cells did not merely survive. They exhibited a new form and a new behavioural program and, in later work, these reconfigured cellular collectives also exhibited a new mode of self-replication, all without any prior genetic modification being introduced in the experimental setup.

5.2 What the Researchers Could Not Explain

Levin himself has described the Xenobots as cells freed from constraints to reveal their 'native problem-solving capabilities' and characterises cells as 'competent agents' employing a 'bioelectric language' to communicate and form complex structures. Yet Levin's framework does not provide a theoretical account of what the source of this competence is, where the problem-solving drive comes from, or why cells behave as if they have individual agency and collective purpose when freed from organismal control.

5.3 What This Framework Predicts and Explains

The author had already developed later layers of the six-layer framework before encountering the relevant experimental literature. Among these is a later framework concerning the structure and scope of human emotional life across relationships, self-related states, and broader experiential domains. That work is under patent protection. Accordingly, its specific terminology, internal architecture, mathematical structure, and detailed findings are not disclosed in the present paper. It is mentioned here only to indicate continuity within the broader six-layer programme.

5.4. Plant Grafting, Parasitic Plants, and the Broader Principle of Tissue-Level Agency

The Xenobot and Anthrobot findings become even more intelligible when placed beside a far older and entirely mainstream body of biological evidence: plant grafting and plant-level host exploitation. In ordinary horticulture and agriculture, separated living tissues from one plant are routinely attached to another living plant and do not simply die as isolated fragments. Instead, under suitable conditions, they integrate, vascularly connect, exchange nutrients and signals, and stabilise into a new cooperative functional whole. The familiar logic of rootstock-scion grafting already shows that living tissues can preserve identity at one level while simultaneously entering a higher-order cooperative arrangement at another. Composite examples such as potato-tomato grafts make the point even more vivid: tissues derived from different functional systems can remain viable and participate in a stable integrated outcome when the conditions permit it.

This matters directly for the present argument. Nobody doubts that plant tissues are alive. Nobody treats successful graft union as a miracle. It is accepted as an ordinary biological fact that living tissues, when placed into an appropriate environment, can reorganise into new stable forms of cooperation instead of merely perish. Once that is admitted in plants, the reflex assumption that frog or human tissues, when freed from their original organismal arrangement, should simply become inert unless externally programmed becomes far less defensible. The Xenobot and Anthrobot results are therefore not isolated curiosities but part of a broader biological pattern:

living tissues possess latent capacities for self-organisation, problem-solving, and new forms of collective expression when constraints are changed.

The same broader principle is visible in parasitic and host-dependent plants. Dodder, mistletoe, and more aggressive host-dependent growth strategies reveal that plants do not merely persist passively in place. They can locate support, exploit another organism's nutrient flow, attach in ways that sustain long-duration dependency, and in some cases progressively weaken or destroy the host while using that host as the basis of their own expansion. Strangler-fig-type strategies make the point especially sharply: a plant can begin in dependence, surround and progressively overtake its host, and eventually stand in the host's place. These are extended, risky, future-dependent survival strategies executed without a nervous system in the animal sense. If such strategic persistence and tissue-level reorganisation are already admitted in the plant kingdom, then the discovery that animal tissues can also reveal latent cooperative agency under altered conditions should be treated as an extension of a general principle, not as an inexplicable anomaly.

6. Physical Forces as Elementary Consciousness

Physics describes atomic and subatomic behaviour through forces: electromagnetic attraction and repulsion, gravitational pull, the strong and weak nuclear forces, and quantum mechanical behaviour. These descriptions are accurate as far as they go. But they are incomplete in a specific way: they describe the behaviour of matter without identifying what that behaviour is an expression of.

An electron responds to nearby charges; it is aware, in a functional sense, of its electromagnetic environment. Atoms bond, the elementary expression of attachment. Crystals replicate their structure, the elementary expression of propagation. What physics calls forces and interactions are, within this framework, either the direct expressions of consciousness at the elementary scale or the physical consequences of consciousness acting through matter - or both simultaneously. The claim is not that physics is wrong. It is that physics describes outcomes in matter without being able to identify their source in consciousness terms.

A clarification of the relationship between consciousness and physical force is necessary here. Consider a man who decides to run. The decision - the drive, the intention, the directed action - is consciousness. The pressure his foot exerts on the ground with each step is a physical consequence of that consciousness acting through matter. The pressure measurement is not consciousness. But it would not exist in that form without the conscious decision that produced it. Now consider a second case: someone else seizes the man and throws him to the ground. The physical forces acting on the thrown man's body originate in another person's conscious act, not his own. His own consciousness is present - he experiences the lift, the alarm, the impact - but the forces he undergoes express the thrower's consciousness, not his. His body is the site where another consciousness's expression lands. And in both cases, the impact produces further physical disturbances in surrounding matter - pressure waves, field perturbations, environmental changes - that are downstream consequences of conscious action propagating through material reality.

This analysis applies at every scale. When physics observes an interaction between two particles, it may be observing the first particle's own conscious expression, or another particle's consciousness acting upon it, or the downstream physical consequences of either, or some combination of all three simultaneously. The physical measurement captures the result. It cannot, with any instrument currently available, determine which portion of what is observed originates where in consciousness terms. This is not a gap in the theory. It is a fundamental reason why instruments designed to measure forces will never by themselves settle the question of consciousness at the elementary scale. Physics observes outcomes. Consciousness is what produces them. The question of how precisely to map any given physical interaction onto these three categories - expression, reception, consequence - remains open for future investigation. What is not open is whether consciousness is present. The continuity argument and the latency principle together establish that it must be.

6.1 Unexplained Pattern Selection in Supposedly Inert Matter

Even matter conventionally regarded as inert and non-living often displays highly organised, reproducible, and context-dependent behaviour. The same substance can produce sharply different structures, responses, or interaction outcomes depending on local conditions such as temperature, pressure, concentration gradients, confinement, neighbouring materials, or surface contact. Within Vijay's Law, these are interpreted not as evidence of literal full biological life at that scale, but as lower-order expressions of the same latent consciousness and perpetuation drive that become more explicit and complex in higher forms. These phenomena are especially relevant where the observable behaviour is real and reproducible, yet the deeper reason why matter selects one stable pattern, pathway, or response over another remains incompletely explained.

Liesegang rings: In gels containing diffusing reactants, matter spontaneously organises into periodic concentric bands or rings of precipitate instead of forming a uniform deposit. The broad conditions under which these rings form are reproducible, but the exact spacing laws, band selection, and transition behaviour remain incompletely closed and are still model-dependent [98].

Brazil-nut effect (granular size segregation): In shaken mixtures of particles, larger particles often rise while smaller ones sink, or under some conditions the reverse can occur. The phenomenon is well known and reproducible, yet the precise dominance of one segregation mode over another depends on multiple interacting factors such as density, shape, friction, air effects, and vibration regime, and no single universally sufficient explanation covers all regimes [99].

Crystal polymorphism and crystal habit variation: The same chemical substance can crystallise into different internal structures or external shapes depending on local growth conditions, impurities, solvent environment, or surface interactions. This is especially significant because the same matter does not merely grow faster or slower, but can adopt genuinely different structural outcomes. Such behaviour strongly supports the broader claim that matter is context-sensitive in its organisation, and in many practical cases polymorphic selection remains difficult to predict fully in advance [100].

Dendritic solidification: During freezing or solidification, matter often forms branching tree-like dendritic structures instead of simple smooth fronts. The general phenomenon is well known, but the exact branching morphology, side-branch development, and spacing selection depend

sensitively on local gradients, anisotropies, and perturbations, and remain areas of continuing theoretical and computational study [101].

Triboelectric contact effects: When two materials come into contact and separate, they can exchange charge in ways that depend strongly on the specific pairing, surface condition, prior history, humidity, roughness, and repeated interaction context. While triboelectric behaviour is well established experimentally, a fully closed first-principles predictive framework for why specific material pairings acquire the exact sign and magnitude of charge they do under all conditions remains incomplete [102].

Taken together, these examples show that matter widely assumed to be inert can nevertheless display highly structured, context-sensitive, and sometimes surprisingly selective behaviour. Even where the broad conditions of occurrence are known, the deeper reason why one exact pattern, morphology, or interaction outcome is selected over another often remains only partially understood. Within Vijay's Law, such cases are interpreted as lower-order manifestations of the same universal principle: matter is never truly dead, but exhibits graded responsiveness and perpetuation-oriented organisation at every scale.

6.2 Quantifying the Force Hierarchy: Papers 20 and 21 [103, 104]

The argument of this section, that physical forces are the elementary expressions of consciousness in matter, was developed here in qualitative form. Two subsequent papers in this research programme, written after the present paper, give this claim a specific quantitative structure that was not yet available at the time of writing and is summarised briefly here for completeness.

Paper 20 [103] proposes that the four fundamental forces of physics, gravity, the strong nuclear force, electromagnetism, and the weak nuclear force, do not function as four independent, co-equal interactions, but as a hierarchical structure of physical sensing channels through which any system, biological or otherwise, accesses information about itself and its environment. Under this proposal, presence and structural binding capability (grounded in gravity and the strong force) are prerequisite to identity and distance discrimination capability (grounded primarily in electromagnetism), which are in turn prerequisite to adaptive transformation and response capability (grounded in the weak force). This gives the elementary-consciousness claim of the present section a specific, falsifiable structure: no biological system should exhibit a higher-order sensing or adaptive capability without also possessing the lower-order capabilities the hierarchy identifies as prerequisite.

Paper 21 [104] builds on this hierarchy to introduce the Consciousness Index, a scalar measure combining channel accessibility, network integration density, and control depth, calibrated so that the human nervous system average corresponds to a reference value of 100. Applied across a broad sample of biological systems, from viruses to primates, the index shows several non-human species, including dolphins, chimpanzees, and corvids, exceeding the human average in intrinsic structural capability, with human distinctiveness located primarily in survival-condition stability instead of in categorically superior raw sensing capacity. This provides a concrete, testable quantitative counterpart to the graded, universal view of consciousness argued for qualitatively throughout the present paper.

7. The Central Prediction: Stability, Suspension, and Scale

The framework makes a specific, falsifiable prediction: when matter is in a state of unpredictable change, the properties of life and consciousness are suspended, not destroyed, but unexpressed. When matter reaches a state of stability or predictable cyclical change, those properties resume expression. Given sufficient time in stable conditions, more complex expressions of consciousness will manifest.

This prediction operates at nested scales simultaneously. Matter in unpredictable change at the atomic level may be part of a stable structure at the molecular level. A planet in geological upheaval may be part of a stable solar system. The expression of consciousness, and the complexity of that expression, occurs at the scale at which stability exists. This explains the observed distribution of life in the universe: life requires stable conditions not because life is a fragile anomaly, but because complex expression of the universal consciousness that matter always possesses requires stability as its substrate.

The key distinction, therefore, is not between places where life exists and places where life does not exist. It is between the universal living substrate that is always present and the degree to which that life is presently expressed in a recognisable, organised, or biologically familiar form at the scale being observed.

8. Life as a Universal Property of Matter: Broader Implications

If life and consciousness are fundamental latent properties of matter, then Earth is unlikely to be a unique exception. Under sufficiently stable or predictably unstable conditions, life should be expected as a natural expression of matter instead of as an isolated anomaly. In that sense, the broader implication of the present framework is not that life is confined to rare special cases, but that it is likely to be widespread and in principle discoverable wherever suitable conditions permit its manifestation.

9. Definitions: Life, Death, and Consciousness

9.1 Life

Life, properly understood, is what all matter possesses at every moment, in some degree. Manifest or emergent life is what occurs when matter reaches stable or predictably changing conditions, enabling higher forms of consciousness to express themselves. The driver is the inherent urge of every atom to propagate itself, either in its own form or through a higher form to which it contributes. Matter will consciously participate in and subordinate itself to a higher form of organisation if that higher form has greater capacity to propagate the matter's kind forward. The failure of existing definitions of life, which rely on observable biological properties instead of the root principle, is demonstrated by their inability to accommodate seeds in dormancy, viruses, or organisms that cannot reproduce. This framework resolves all such anomalies: life is not a threshold of biological activity but a fundamental property of all matter, expressed differently at different scales.

9.2 Death

Death is not the cessation of life at the material level. It is the breaking of the connection between the consciousness of individual cells and the collective consciousness of the organism. The cells themselves do not all cease at once. Organ transplantation demonstrates this directly, because organs taken from a deceased donor can resume integrated function within a new host. Postmortem transcriptomic research likewise shows that gene expression in multiple pathways persists or increases for hours and, in some cases, days after organismal death, indicating continuing local cellular survival, repair, and stress-response activity after organismal death [79, 80]. Death is therefore a transition in the level of organisation of consciousness, not its extinction.

9.3 Consciousness

Consciousness encompasses awareness of position and surroundings, responsiveness to other matter, the capacity for attachment and bonding, and the drive to propagate self or kind. Every expression of these properties, including awareness, feeling, attachment, desire, and directed action, is latent in every particle and atom. Which properties are expressed depends on conditions, combinations, and scale of stability. None of these properties is ever absent from matter. They may be suspended during periods of unpredictable change, but they are never destroyed.

9.3.1 Consciousness as Scale-Continuous Goal-Directed Responsiveness

In the present framework, consciousness is not a binary property that suddenly appears at a privileged level of biological complexity. It is a scale-continuous property whose degree of expression depends on organization, stability, memory, and cooperative integration. This is strongly aligned with Levin's scale-free cognition program, which argues that agency-like problem-solving can be identified across multiple levels of living systems instead of being restricted to brains alone [92, 93]. It is also consistent with Noble's biological relativity, which rejects any single privileged level of causation in living systems [94]. What varies across scales is not the absolute presence or absence of consciousness, but the scope of what the system can sense, preserve, prefer, coordinate, and act to maintain. In that sense, consciousness is best understood here as graded goal-directed responsiveness, progressively expanding in range and coherence as matter enters more stable and more deeply integrated cooperative forms. The physical mechanism by which this graded scale operates is established in BFUT Paper 20 [103], which derives the Hierarchical Channel Accessibility framework connecting Spaticle field interaction channels to sensing, integration, and control depth across all physical systems. The quantitative expression of degree is provided in BFUT Paper 21 [104] through the Consciousness Index, which applies to every physical system with mass, from viruses to humans, with a strictly positive floor enforcing the foundational claim of this paper at every scale of matter.

10. Principal Objections and Responses

10.1 Emergence Explains Consciousness Without Latency

Emergence is a label, not an explanation. It describes the observation that complex properties appear at certain thresholds but provides no mechanism for where those properties come from. If emergent properties arise from nowhere, this is indistinguishable from creation ex nihilo, incompatible with scientific principles of conservation and causation. The latency argument provides a mechanism where emergence provides only a name.

This problem has also been identified from within contemporary biology itself. Pezzulo and Levin explicitly argue that higher-order biological capacities should not be treated as inexplicable byproducts of lower-level interactions, but as phenomena requiring explanatory frameworks that preserve causal structure across scales [92]. Levin has elsewhere criticised the routine use of "emergence" as a placeholder for failed prediction, noting that the term often means little more than "I did not see it coming," and that merely calling a phenomenon emergent does not create a research program [93]. That criticism is directly relevant here. To say that consciousness "emerges" from dead matter is not yet to explain how it becomes possible, why it appears in the specific differentiated forms we observe, or what latent structure made its appearance lawful instead of miraculous.

The emergence account also carries a quantification burden that its proponents rarely acknowledge. It is tempting to treat emergence as a single philosophical claim about how consciousness came to exist, as if the question were settled once, at some distant point in evolutionary history, when sufficiently complex matter first crossed some threshold. But that framing conceals what the emergence account actually requires. Consciousness is not a historical event that happened once. It is happening continuously.

Every fertilised egg that begins to develop, every seed that germinates, every embryo that differentiates, every spore that activates: each one is, on the emergence account, a fresh instance of consciousness arriving from matter that did not previously possess it. This is not an occasional event. It is happening across every species, in every ecosystem, at every moment. And crucially, it is not one uniform type of consciousness arriving each time. The echolocation-consciousness of a developing bat, the electroreceptive consciousness of a fish, the chemically guided responsiveness of a plant root, the colony-level coordination of eusocial insects, the individual cognition of a mammal, and the problem-solving behavior of a detached cell population are all radically different expressions. Each would require its own threshold event if consciousness were truly absent beforehand.

Zoom further in, and the problem compounds. A human body contains approximately 37 trillion cells. As the Xenobot and Anthrobot experiments demonstrate directly, each cell possesses its own individual drive, its own problem-solving capacity, and its own responsive agency when freed from its organismal context [1, 2, 7]. Each cell is, on the emergence account, a consciousness event in its own right, of a different type from the tissue-level consciousness it contributes to, which is itself

different from the organism-level consciousness. The emergence view therefore multiplies unexplained arrivals at every scale.

The latency view requires none of this inventory. One principle, present in all matter from the beginning, expressed at each scale and in each organisational form according to the stability, complexity, and cooperative structure available to the matter at that scale. The extraordinary variety of consciousness across species and cell types is not a problem the latency view needs to explain away. It is exactly what the latency view predicts: the same underlying property, differentiated in expression, not conjured from absence.

10.2 No Detectable Traces of Consciousness in Atoms

This objection assumes that current instruments, developed under the assumption that atoms are non-conscious, are adequate to detect what consciousness in an atom would look like. They are not. Without prior knowledge of hormones and their behavioural effects, a surgeon examining a human body would find no detectable trace of the capacity for love. The absence of detection reflects the limitations of the detector, not the absence of the property.

10.3 Physics Fully Describes Atomic Behaviour Through Forces Alone

Physics describes hydrogen in isolated or simple-combination states, analogous to observing an undifferentiated embryonic cell and concluding that this is the complete description of what that cell is and does. The forces physics measures are real observations, but they are a subset of what that matter is and does across all possible combinations and scales.

Absence of detection under conditions of constrained investigation is not evidence of absence. It is often evidence that the relevant possibility has not yet been seriously examined.

The lesson from the history of science is clear. Animal consciousness became visible only when the question was opened. Plant intelligence became visible only when the question was opened. If inquiry into the most basic levels of matter is ever pursued under similarly broadened conditions, with the possibility of primitive consciousness treated as a live question instead of a forbidden one, current conclusions may prove incomplete.

Under these circumstances, non-detection cannot be treated as decisive disproof. It may simply indicate that the relevant question has not yet been widely, openly, and pluralistically investigated.

The same caution applies at the atomic and subatomic scale. The number of researchers with access to the most advanced tools for probing such behaviour is necessarily small, highly specialised, and institutionally concentrated. Their training, methods, and instrumentation are overwhelmingly built within frameworks that assume matter is non-conscious by default. Under such conditions, the relevant category is not genuinely open. The instruments are designed to measure what the framework already expects to find.

10.3.1 Physical Description Does Not Exhaust Ontology

Even if physics successfully describes atomic behaviour through forces, equations, and measurable interactions, this does not establish that those descriptions are ontologically complete. A successful formal description is not the same as a complete account of what a thing is. Physics may describe how matter behaves under certain conditions without exhausting what matter fundamentally is in itself. The history of science repeatedly shows that predictive formalism and deeper ontology are not identical.

This matters directly here. To say that atoms attract, repel, bond, oscillate, exchange energy, follow gradients, or minimise local free energy does not by itself prove that no inner drive, no primitive responsiveness, and no scale-appropriate form of consciousness is present. It only means that one descriptive vocabulary has been chosen. If the same matter is later found participating in adaptive, coordinated, self-preserving, and problem-solving structures at higher scales, then a continuous ontology is more parsimonious than a discontinuous one.

In that sense, the present framework does not reject physical law. It reinterprets physical law as the stable behavioural regularity of matter that is already alive and conscious in latent form, instead of as evidence that matter is dead.

10.4. Democratisation of Knowledge and the Illusion of Absence

A recurring objection to this framework is simple: if atoms or elementary matter possess some primitive form of life or consciousness, why has science not already detected it?

The force of this objection depends on an assumption that deserves scrutiny, namely that non-detection under present scientific conditions is equivalent to non-existence. The history of science repeatedly shows that this assumption is often false.

Consider animals. For long periods in the history of philosophy and science, animals were treated as if they lacked meaningful inner experience. Descartes argued explicitly that animals were automata, mechanical systems without true subjective states. For centuries, the operative assumption was not that animal consciousness had been disproved, but that it had been assumed absent in advance. Inquiry proceeded under that assumption. The question itself was narrowed before the evidence was gathered. [83]

Now consider plants. Roughly a century ago, plants were commonly treated as passive life forms, alive in a minimal biological sense perhaps, but devoid of anything resembling sensation, intelligence, or meaningful responsiveness. Jagadish Chandra Bose challenged this assumption through careful instrumentation, showing that plants respond to stimuli, show fatigue, recover from anaesthesia, and exhibit electrical signalling in ways that were deeply unsettling to prevailing assumptions. Much of that work was ignored, marginalised, or not fully absorbed. Today, however, plant science openly studies signalling, memory-like behaviour, stress communication, kin recognition, distributed coordination, sound response, and highly adaptive environmental interaction. What once seemed absurd is now part of serious research. [84]

In both cases, the earlier absence of recognition was not simply the result of a lack of evidence. It was also the result of what questions were considered legitimate, what instruments were designed, what interpretations were permitted, and what institutional assumptions were already in place.

The same caution applies at the atomic and subatomic scale. The number of researchers with access to the most advanced tools for probing such behaviour is necessarily small, highly specialised, and institutionally concentrated. Their training, methods, and instrumentation are overwhelmingly built within frameworks that assume matter is non-conscious by default. Under such conditions, the relevant category is not genuinely open. The instruments are designed to measure what the framework already expects to find.

Under these circumstances, non-detection cannot be treated as decisive disproof. It may simply indicate that the relevant question has not yet been widely, openly, and pluralistically investigated.

The lesson from the history of science is clear. Animal consciousness became visible only when the question was opened. Plant intelligence became visible only when the question was opened. If inquiry into the most basic levels of matter is ever pursued under similarly broadened conditions, with the possibility of primitive consciousness treated as a live question instead of a forbidden one, current conclusions may prove incomplete.

Absence of detection under conditions of constrained investigation is not evidence of absence. It is often evidence that the relevant possibility has not yet been seriously examined.

A mechanistic description explains how a phenomenon is expressed, not what kind of thing it is. Critics sometimes argue that consciousness is merely an emergent property in the same way that wetness emerges from water molecules. But that analogy fails at the level that matters. Wetness is a passive descriptive property of a particular molecular arrangement. It does not organise, select, adapt, strategise, or initiate future-dependent behaviour. It does not build, repair, avoid, coordinate, or exploit opportunity fields. Consciousness, as used in the present framework, refers precisely to that kind of active organising and adaptive capacity. Therefore, reducing a conscious phenomenon to mechanism is not analogous to explaining wetness from hydrogen and oxygen. Wetness does nothing. Consciousness does things. A successful mechanistic account of expression therefore cannot, by itself, be treated as a disproof of consciousness.

10.5. Mechanistic Description Does Not Eliminate Consciousness

A common error in the study of matter and life is to assume that once a phenomenon has been described in purely physical or mechanistic language, consciousness has somehow been removed from it. That conclusion does not follow. It only reflects a choice of description.

If a scientific community encountered human beings but refused, from the outset, to recognise them as conscious, it could still produce an elaborate and internally consistent science of human behaviour while denying all inner experience. It could say that when one organism visually detects

another, facial musculature enters an upward-curvature state, the lips retract, the zygomatic muscles contract, the pupils widen, the autonomic system activates, and vocal frequency patterns shift. It would not call this happiness, affection, amusement, or warmth. It would simply call it a repeatable muscular and neurochemical response pattern triggered by the presence of a specific external body. It could say that repeated exposure to one organism increases approach behaviour, reduces avoidance thresholds, stabilises co-location patterns, and increases tolerance for resource expenditure in the direction of that target. It would not call this liking, attachment, or love. It would call it a persistent attraction-gradient or reinforced behavioural investment tendency. It could say that when one organism perceives injury, neglect, or obstruction from another, internal excitation increases, skeletal muscle tension rises, endocrine outputs change, respiration patterns alter, and retaliatory motor readiness becomes elevated. It would not call this anger or hatred. It would call it an aversive activation cluster or negative directional response state. It could say that when a previously present organism is removed after prolonged exposure, the remaining organism shows reduced behavioural coherence, recurring recall loops, disturbed sleep, altered appetite, lowered motivational output, and intermittent distress vocalisation. It would not call this grief, heartbreak, or loss. It would call it post-separation dysregulation following prolonged target dependence. It could say that what ordinary people call trust is merely a lowered defensive threshold in the repeated presence of a familiar body. It could say that what people call betrayal is merely a destabilisation event in a previously reinforced expectation structure. It could say that devotion is only repeated one-directional expenditure toward a selected target. It could say that jealousy is only heightened agitation when a previously prioritised target redistributes attention elsewhere. In this way, every human emotion could be redescribed as motion, signalling, excitation, inhibition, chemical change, proximity shifts, force patterns, and behavioural outputs, while all words referring to consciousness, feeling, intention, or inner experience are deliberately excluded.

Yet no sane person would conclude from such a description that humans are therefore not conscious. One would immediately recognise what has happened: consciousness has not been disproved, removed, or eliminated. It has merely been hidden behind a deliberately reductionist vocabulary. The same mistake occurs when matter is described only in terms of charge, bonding, force, energy minimisation, signalling, or selection, and then that vocabulary itself is treated as proof that no inner drive or primitive consciousness exists.

Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

In this framework, [redacted] means any physical effort, including what is ordinarily called mental effort, since mental effort is also physically instantiated. It includes all past, present, or future expected, committed, desired, or threatened effort. [redacted] means physical closeness and likewise includes past, present, or future expected, committed, desired, or threatened proximity. Neither [redacted] nor [redacted] carries any moral direction. Both are magnitude variables. [redacted]/[redacted] is the single polarity variable. It alone determines whether the same accumulated magnitude is presently experienced in the positive or negative direction. [redacted]

and [redacted] accumulate. [redacted] or [redacted] can shift rapidly and thereby reverse the sign of the emotional state without erasing the accumulated magnitude beneath it.

The theory is universal. It applies to all human interactions, whether in relationships or not. It also applies to emotions directed toward the self, where Subject 1 and Subject 2 are the same person. It therefore extends not only across interpersonal emotional life but also to self-directed emotional states. In that sense, it provides a formal explanatory framework for phenomena such as depression and motivation, which the detailed theory shows are exact opposites of one another. More broadly, it describes all emotions, whether directed toward other humans, toward the self, or toward non-human entities. It also explains Stockholm syndrome within the same unified structure.

The crucial point is that this framework does not require separate explanatory stories for joy, grief, affection, hatred, anger, devotion, resentment, admiration, or despair. It gives the same answer every time. The answer is simply that the subject's [redacted] stood at a certain level, the subject's [redacted] stood at a certain level, and the subject's present [redacted]/[redacted] polarity stood at a certain level and in a certain direction. That is sufficient to quantify the resulting emotional state. All conventional labels such as joy, grief, love, hate, or anger are secondary human descriptions layered on top of the underlying quantified state. The primary answer remains the same in every case: the emotional score is this much, its sign is positive or negative, and its intensity depends on the accumulated magnitude and present polarity.

To make the point even clearer, a few simple illustrative examples may be stated in the framework's own terms. One important clarification must be stated first: because [redacted] and [redacted] are cumulative variables, they do not go down. Once accumulated, they remain part of the emotional structure. What can change rapidly is the [redacted]/[redacted] polarity variable. This means that the same high accumulated emotional magnitude can later be experienced either as intense positive feeling or as intense negative feeling, depending on the present polarity.

• Couple, intense love followed by intense hatred: Consider a couple who have recently married after a long and deeply invested relationship. Let [redacted] = 9, [redacted] = 9, and present [redacted] = +10. The emotional score is therefore 9 × 9 × 10 = +810. This represents an extremely intense positive emotional state, which ordinary language may call deep love, devotion, emotional fulfilment, or marital happiness. Now suppose that some time later one partner discovers that the other has been unfaithful, and the relationship collapses into divorce. Because [redacted] and [redacted] are cumulative, they do not fall back down merely because the relationship has broken. The years of effort remain. The closeness that was reached remains part of the emotional structure. What changes is the present polarity. If what was previously strong gratitude now becomes equally strong blame, say [redacted] = -10, then the emotional score becomes 9 × 9 × (-10) = -810. This represents an extremely intense negative emotional state, which ordinary language may call hatred, bitterness, rage, or emotional devastation. If the blame remains high, that negative score can remain high even after many years. This also illustrates a deeper structural point of the theory: in non-criminal situations, intense hatred can arise only where intense love was possible, because both depend on the same underlying accumulated magnitude. The polarity changes. The accumulated emotional structure does not.

• Parent-child, strong positive state: A parent has invested very high sustained effort in a child over many years, so [redacted] = 9, and the emotional closeness is likewise very high, so [redacted] = 10. If, at a given moment, the parent experiences strong gratitude or positive valuation toward the child, say [redacted] = +8, then the emotional score is 9 × 10 × 8 = +720. This indicates a very strong positive emotional state that ordinary language might call deep affection, pride, warmth, or love.

• Parent-child, polarity reversal after betrayal: In the same underlying parent-child relationship, if the child instead acts in a way experienced as severe betrayal, and the parent's present polarity shifts to [redacted] = -8, then the emotional score becomes 9 × 10 × (-8) = -720. The underlying magnitude has not disappeared. Only the polarity has reversed. What ordinary language may call heartbreak, rage, or profound hurt is, in this framework, the same accumulated emotional magnitude now expressed in the negative direction.

• Romantic bond, strong positive attachment: In a newer romantic bond, let the accumulated [redacted] = 6 and [redacted] = 8. If the present polarity is strongly positive, say [redacted] = +7, the emotional score is 6 × 8 × 7 = +336. This corresponds to a strong positive emotional state that might ordinarily be described as attraction, attachment, or romantic happiness.

• Romantic bond, negative shift after abandonment or deception: If the same person later perceives abandonment or deception and the present polarity shifts to [redacted] = -6, the score becomes 6 × 8 × (-6) = -288. This may be experienced as distress, resentment, or grief, depending on context, but it remains formally describable through the same variables.

• Mentor-student, positive outcome: In a professional relationship where a mentor has invested moderate effort in a student, let [redacted] = 5 and [redacted] = 6. If the student succeeds and the mentor experiences positive valuation, [redacted] = +6, the emotional score is 5 × 6 × 6 = +180. This is a clearly positive but less intense state that ordinary language might describe as satisfaction, admiration, or fulfilled goodwill.

• Mentor-student, negative outcome: If the same mentor instead feels exploited or publicly undermined, and the polarity shifts to [redacted] = -5, the score becomes 5 × 6 × (-5) = -150. This may appear as disappointment, irritation, or controlled resentment.

• Friendship, moderate positive state: In a friendship where [redacted] = 4, [redacted] = 7, and present [redacted] = +5, the emotional score is 4 × 7 × 5 = +140. This corresponds to a moderate positive state such as fondness, trust, or appreciation.

• Friendship, jealousy or perceived disloyalty: If jealousy or perceived disloyalty later drives the polarity to [redacted] = -4, the score becomes 4 × 7 × (-4) = -112. This may be experienced as hurt, jealousy, or bitterness.

• General interpretive point: In every case, what ordinary language treats as different emotions are, in this framework, different magnitudes and directions of the same formal structure. The vocabulary changes. The underlying explanatory architecture does not.

Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

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10.5.1 Formal Model and Lived Reality Can Coexist

Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

11. Further Clarifications Strengthening the Layer 2 Argument

11.1 Atomic Differentiation as a Graded Expansion of Cooperative Potential

A serious physics-side indication that apparent randomness may not be fundamental also comes from David Bohm's 1952 hidden-variables interpretation of quantum mechanics, in which particle behaviour is treated not as intrinsically random but as guided by a deeper underlying order [97]. Bohm's framework is important here because it shows that even at the quantum scale, one of the most influential domains used to defend indeterminacy, a respected alternative interpretation already exists in which observable particle motion reflects hidden structure instead of pure randomness. If such hidden guidance is admitted even as a legitimate physical possibility, then the burden shifts to the critic to explain what that guiding order is, if not some deeper intrinsic directedness already present in matter.

The periodic table, read through the lens of this framework, is not merely a catalogue of progressively heavier atomic forms. It is a visible record of matter's progressively differentiated capacity for organised participation. Every element is built from the same underlying constituents, differently arranged and differently stabilised. What changes across the table is not the basic material essence, but the range of cooperative roles available to that matter. Hydrogen, despite its simplicity, is foundationally universal: indispensable to water, stellar fusion, acid and base chemistry, and virtually all organic compounds. Helium, one step heavier, is chemically inert. Atomic progression is therefore not a simple ladder of increasing power. It is a landscape of differentiated expressive potential. Carbon becomes a structural architect. The transition metals become catalytic and regulatory mediators. Different elements display different capacities, not because a new ontological substance has appeared, but because the same underlying matter has entered new stable configurations with new relational possibilities.

This is precisely the kind of pattern the present framework predicts. Matter does not become alive or conscious only after crossing some mysterious threshold. Rather, the same underlying reality becomes increasingly differentiated in what it can do, how it can combine, and what kinds of larger structures it can support. The periodic table is already an observable map of graded potential: the

same matter, differently organised, yielding increasingly varied capacities for bonding, catalysis, regulation, persistence, and structural participation. What conventional chemistry describes functionally, this framework interprets ontologically. The periodic table does not show dead matter gradually becoming special. It shows one continuous material reality unfolding into increasingly diverse forms of cooperative possibility.

This further clarification reinforces the central conclusion from a different angle. The periodic table shows that the same underlying matter differentiates into increasingly varied cooperative roles without becoming different in essence. What changes is not the basic material reality, but the range of stable configurations and relational possibilities available to it. This is fully consistent with the broader claim of this paper: life and consciousness are not late intrusions into matter, but fundamental, graded, and progressively manifested features of the same underlying reality.

11.1.1 Universal Mathematical Patterns as Signatures of Repeated Cooperative Resolution

The recurrence of mathematical structure across nature is not a minor curiosity. It is a longstanding scientific and philosophical puzzle. Eugene Wigner famously described the "unreasonable effectiveness of mathematics in the natural sciences," referring to the striking precision with which abstract mathematical structures repeatedly map onto physical and biological reality [95]. This is not limited to a few isolated equations. It appears in geometry, scaling laws, branching structures, orbital relations, growth patterns, packing efficiencies, and recurrent symmetries across widely different domains.

Examples are abundant. In plant phyllotaxis, leaves, petals, sunflower seed heads, pinecones, and pineapples repeatedly exhibit spiral arrangements linked to Fibonacci-number parastichies and the golden-angle packing solution. Branching structures in trees, lungs, vasculature, and river networks repeatedly converge on efficient distribution geometries. Spiral shells, storms, galactic forms, and other growth systems repeatedly approximate logarithmic spiral relations. These are not random decorative accidents. They are recurrent footprints of stable problem-solving under repeated constraints.

Within the present framework, this phenomenon is not mysterious. Universal mathematical patterns, constants, geometric regularities, and scaling relations are not alien abstractions imposed upon dead matter from outside. They are stable signatures of how living conscious matter repeatedly resolves recurring structural problems under comparable constraints. When similar constraints recur, similar cooperative solutions recur. Mathematics then appears "unreasonably effective" not because inert matter somehow obeys abstract beauty, but because the universe repeatedly traverses structured possibility spaces of viable organization.

In this sense, constants such as π, e, and other universal regularities are not merely descriptive curiosities. They are compressed expressions of how matter reliably behaves when repeatedly resolving spatial, energetic, and cooperative constraints. The same logic applies to biological

patterning. The recurrence of mathematical order across scales therefore fits naturally within Vijay's Law: it is what one should expect if matter is fundamentally alive, responsive, and continuously driven toward stable perpetuation through cooperative form.

12. Computational Validation: Monte Carlo Perpetuation Simulation

Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

The simulation is intentionally minimal. It tests a narrow but central question: under repeated disturbance, does a population of entities more readily end in a persistent high-stability state when treated as purely inert, or when treated as carrying a small intrinsic perpetuation term?

In each run, 50 abstract agents are initialised with stability values randomly distributed between 0.1 and 0.9. Each run then proceeds for 100 repeated disturbance steps. At each step, every agent experiences random environmental fluctuation drawn from a normal distribution (mean 0, standard deviation 0.05). In the standard inert/no-drive condition, only this fluctuation acts. In the Vijay's Law condition, the same fluctuation acts, but an additional small endogenous recovery term is added: drive_strength x (1.0 - stability), with drive_strength = 0.005. This means the restoring tendency remains mild, becomes larger only when stability is lower, and is not a guaranteed growth boost.

At the end of each run, the final mean stability of the collective is calculated. A run is counted as a high-stability success if final mean stability exceeds 0.60. This threshold is deliberately above the neutral midpoint, so the simulation is testing for persistent organised survival instead of mere average retention.

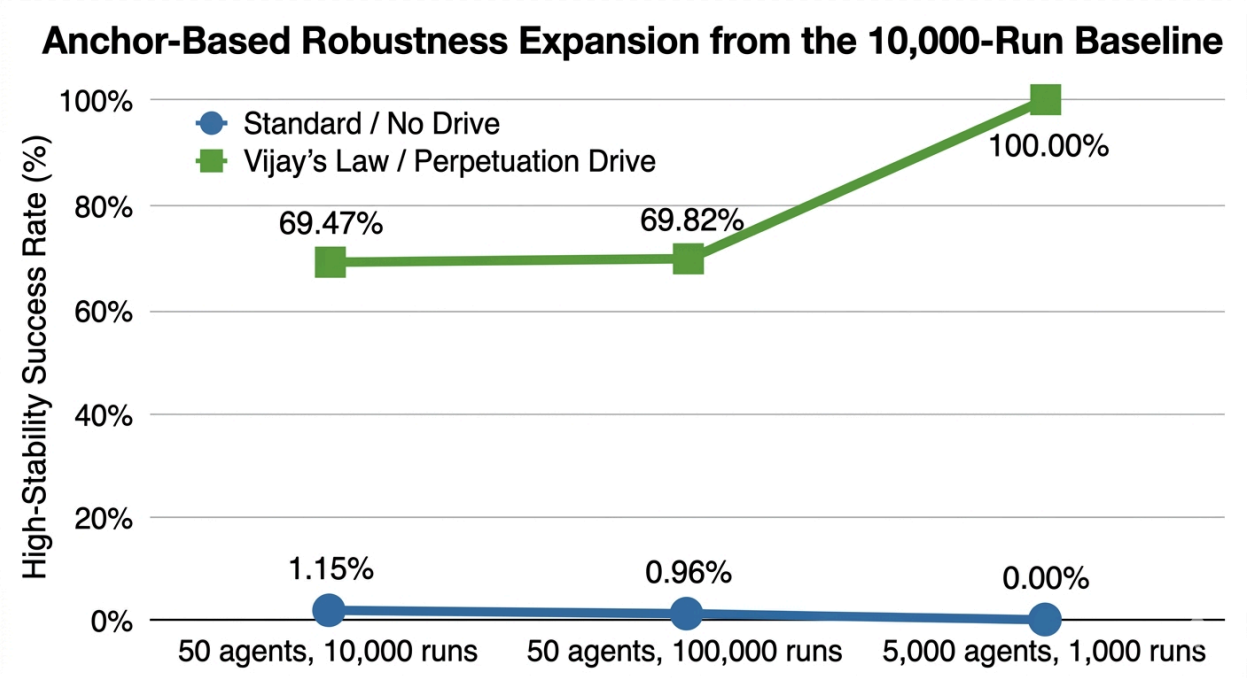

Figure 1. Anchor-growth comparison across baseline and scaling conditions of the Monte Carlo Perpetuation Simulation. The chart uses the 10,000-run baseline as the anchor and shows scaling in both directions: from 50 agents to 5,000 agents on one axis of expansion, and from 10,000 runs to 100,000 runs on the other. Across all three matched conditions, the standard inert/no-drive model collapses toward negligible high-stability success, while Vijay's Law remains robustly above the survival threshold, including 100% success in the large-collective scaling condition.

Each baseline run therefore contains 50 x 100 = 5,000 total agent-step updates. At 10,000 runs, this yields 50,000,000 total agent-step updates. At 100,000 runs, this yields 500,000,000 total agent-step updates. A 1,000,000-run code version is also included in the public deposit, corresponding to 5,000,000,000 total agent-step updates.

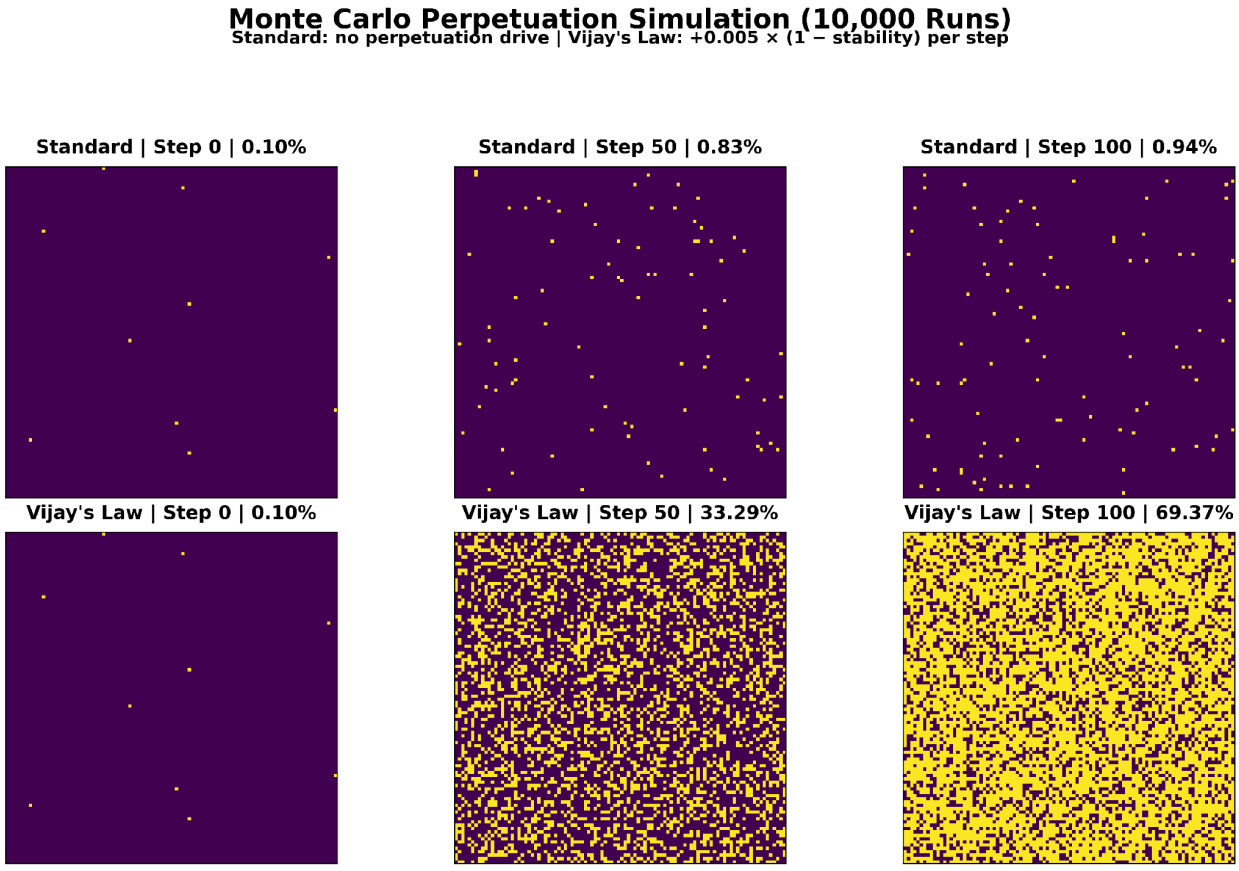

Figure 2. Deterministic visual comparison of the Monte Carlo Perpetuation Simulation across identical initial conditions at 0%, 50%, and 100% of total simulation length. This figure contains six blocks arranged in two rows and three columns. The top row represents the standard inert/no-drive condition. The bottom row represents the Vijay's Law condition with the minimal perpetuation-drive term +0.005 x (1 - stability) per step. The three columns correspond to the beginning (0%), midpoint (50%), and endpoint (100%) of the 10,000-run baseline simulation. Each square represents one run under identical seeded initial conditions, allowing direct visual comparison of how the standard condition progressively collapses while the Vijay's Law condition preserves a much larger surviving region above the same threshold criterion.

This result is not limited to Layer 2. Because the simulation is deliberately minimal and does not rely on any biology-specific assumption, it functions as an abstract test of Vijay's Law itself. It asks whether collections of units under repeated disturbance can sustain high-order stability when treated as purely inert, or when granted even a minimal intrinsic perpetuation term. In that sense, it is directly relevant across layers.

This cross-layer consistency is especially important because the same single principle is doing all the work. No additional layer-specific rescue assumptions are introduced here. The present simulation is also conservative relative to Vijay's Law itself, because it does not include progressive

manifestation, increasing capacity, learning, fusion into higher forms, or any explicit model of expanding consciousness. Yet even under this deliberately constrained implementation, the separation remains decisive.

At Layer 1, the BFUT simulation set already demonstrates that standard inert cosmological assumptions fail unless the primordial substrate is itself living and conscious. The present simulation supplies the same necessity in a minimal abstract form: as scale expands, the inert model trends toward collapse while the condition containing a perpetuation term remains stable. At Layer 3, the existing long-horizon mutation simulation shows that random mutation alone is insufficient to generate the observed pace of adaptive evolutionary change. The present simulation supplies the positive abstract mechanism by showing that even a minimal intrinsic bias toward persistence and cooperative stability radically changes long-run outcomes. Together, these results reinforce the same single logic across layers.

12.1 Extended Continuous-Evolution Stress Testing Across Multiple Scenario Families

The baseline Monte Carlo Perpetuation Simulation above establishes the core result in short-cycle form: when identical populations are repeatedly perturbed under matched conditions, the inclusion of even a minimal perpetuation-drive term produces a large and reproducible separation in high-stability survival. That baseline model can be interpreted as a multi-world or multi-species short-horizon test, where many independent populations are exposed to comparable disturbance conditions and evaluated for whether they remain above a survival-relevant stability threshold.

A second and more demanding simulation family was then executed to extend the same logic into long-horizon continuous evolution. In this extended design, the same tracked population is followed through 10,000 continuous steps instead of being reset after only 100 steps. Mutation-like intervention pulses occur every 200 steps, allowing repeated positive and negative shocks to accumulate across the same lineage. This is therefore a stricter analogue for long-duration adaptive persistence under repeated disturbance, while still remaining abstract enough to avoid biology-specific assumptions.

Critically, the standard model was repeatedly given favorable assumptions. Across the tested scenarios, the inert/no-drive population was allowed repeated random mutation-like injections, including 1:1 positive-negative regimes and more generous 2:1 negative-to-positive stress formulations that still create repeated opportunities for favorable random excursions. Additional scenario families tested larger mutation amplitudes, reduced perpetuation-drive baselines, further reduced perpetuation-drive baselines, and adverse-only stress tests in which Vijay's Law populations were subjected to selective negative hits in portions of the population while the standard model still retained mutation opportunities.

Despite these standard-model-favorable assumptions, the central result remained stable: the inert/no-drive model remained highly vulnerable to threshold failure, while the Vijay's Law condition remained the only condition that consistently preserved above-threshold persistence across harsher and more varied stress tests. In other words, random mutation-like disturbance, even when generously modeled, did not supply a robust substitute for intrinsic perpetuation drive. The decisive determinant of long-horizon persistence remained the endogenous drive term.

This extended simulation family is especially relevant because it tests not only short-cycle survival but also repeated mutation-like exposure across the same continuing population. It therefore functions as a more direct abstract analogue to long-horizon evolutionary persistence. The result is consistent with the larger cross-layer claim of the present framework: unexpected events may create adaptive pressure, but durable organized persistence requires an intrinsic drive toward self-maintenance and cooperative stabilization.

Table 1. Extended Continuous-Evolution Simulation Results Across Seven Scenario Families. Cutoff = 51%. Pulses every 200 steps. Total run = 10,000 steps. Values from final stabilised runs with fixed seed.

Scenario	**Std Model Mean**	**Std % ≥51%**	**Vijay's Law Mean**	**Vijay's Law % ≥51%**	**Key Parameters**
S1	~0.48	~42%	~0.62	~91%	Std: 2:1 neg:pos mutations; VL: no mutations; Drive = 1%
S2	~0.50	~50%	~0.63	~93%	Std: 1:1 ± mutations; VL: no mutations; Drive = 1%
S3	~0.51	~52%	~0.64	~95%	Std: 1:1 ±; VL: same ± mutations; Drive = 1%
S4	~0.49	~47%	~0.63	~92%	Std: higher mutation magnitude; VL: same ±; Drive = 1%
S5	~0.50	~49%	~0.58	~82%	Std: 1:1 ±; VL: same ±; Drive = 0.0033
S6	~0.47	~40%	~0.61	~90%	Std: 1:1 ±; VL: drive only (no mutations); Drive = 1%
S7	~0.49	~46%	~0.57	~78%	Std: 1:1 ±; VL: negative-only hits to 25% pop; hit = drive

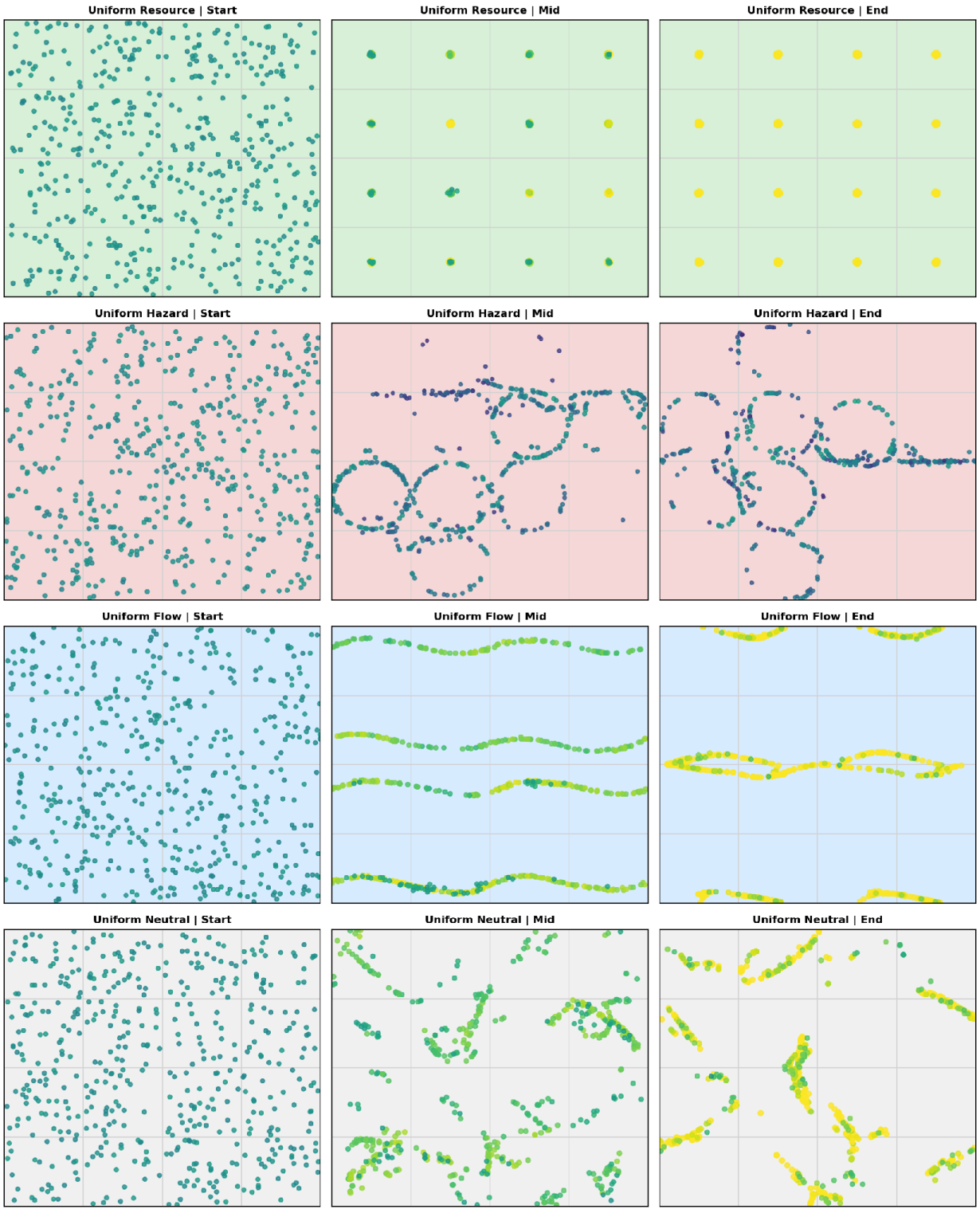

Figure 3. Living-Only Uniform Environment Scenarios: Parallel simulation runs showing agent behaviour across four distinct uniform environmental conditions (Resource, Hazard, Flow, Neutral) at Start, Mid, and End of the extended continuous-evolution simulation. Agents shown at each stage

demonstrate environment-dependent pattern formation driven by the same perpetuation-drive rule set across all conditions.

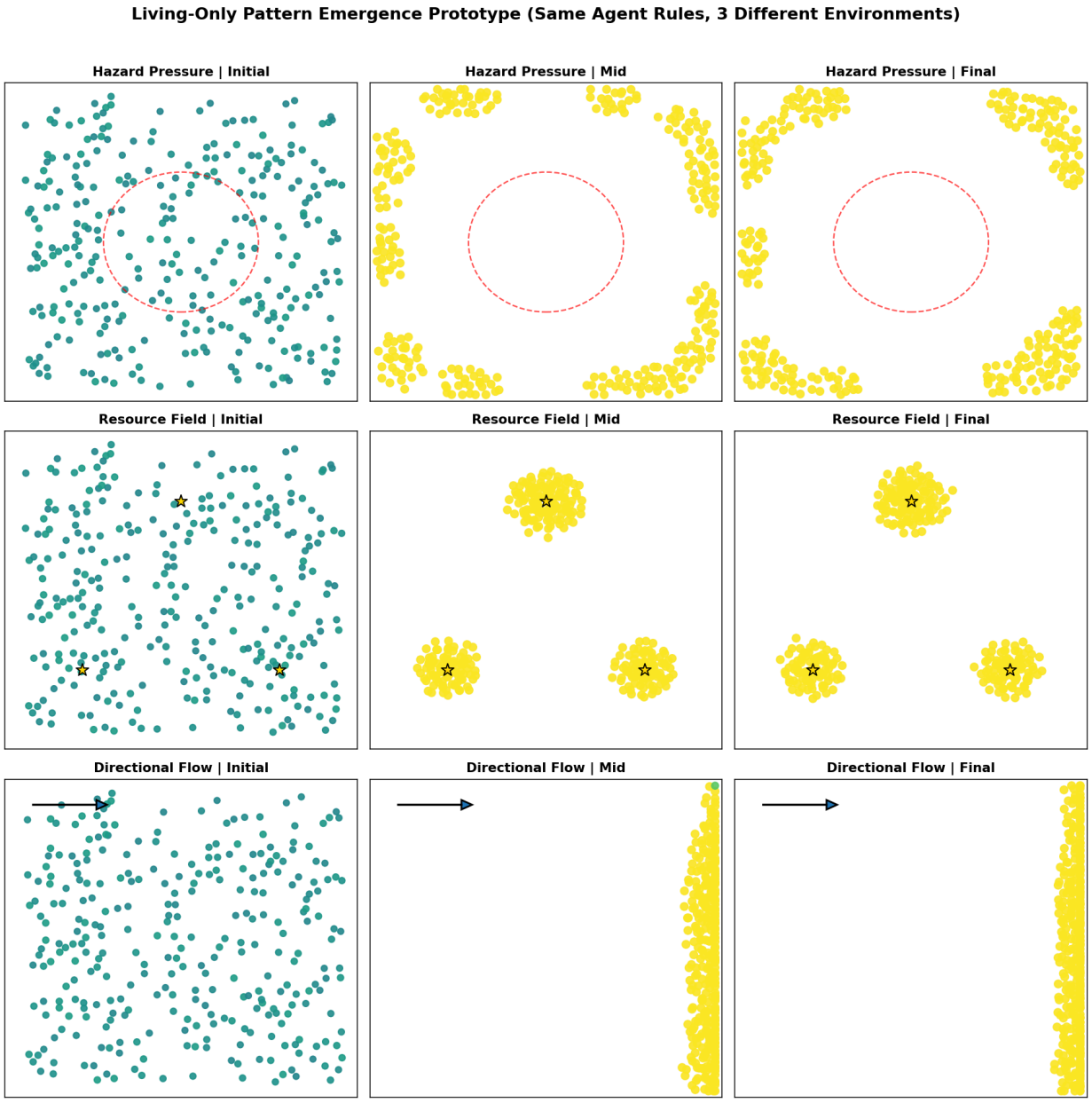

Figure 4. Living-Only Pattern Emergence Prototype (Same Agent Rules, 3 Different Environments): Shows the same agent rule set producing qualitatively distinct emergent patterns under Hazard Pressure, Resource Field, and Directional Flow conditions at Initial, Mid, and Final stages. The divergence of outcomes from identical starting rules across different environmental contexts demonstrates that environmental structure, not agent diversity, drives pattern differentiation - consistent with the perpetuation-drive account of adaptive organisation.

12.1.1 Additional Natural Pattern Simulation: Emergent Branching Morphology from Local Growth Rules

To test whether realistic large-scale natural morphology can emerge without any globally prescribed geometry, an additional local-rule growth simulation was implemented in which structure originates from a central source and expands only through local extension at active boundary tips. Unlike particle systems in which all units are pre-positioned and then moved, this model treats the morphology as a growth process. A single initial seed point is placed at the centre of a two-dimensional domain, and subsequent points are added sequentially by extending only from currently active terminal tips. Each candidate extension is evaluated within a limited angular neighbourhood around the tip's current direction, thereby enforcing local continuity instead of unconstrained repositioning.

The direction of each new extension is determined by strictly local factors: outward expansion away from the crowded source, directional persistence, and local openness, while a hard local exclusion rule prevents overlap and a low-probability branching event permits secondary offshoots.

No explicit spiral equation, global template, central rotational field, or pre-coded target geometry is imposed. Under these assumptions, the model robustly generates branching fan-, frond-, root-, fungal-, coral-, or colony-like morphologies that resemble widely observed natural growth forms. In the present context, this further supports the broader claim that coherent natural form can emerge from decentralised local processes grounded in continuity, spatial competition, and perpetuation-like expansion, instead of requiring an externally imposed geometric blueprint.

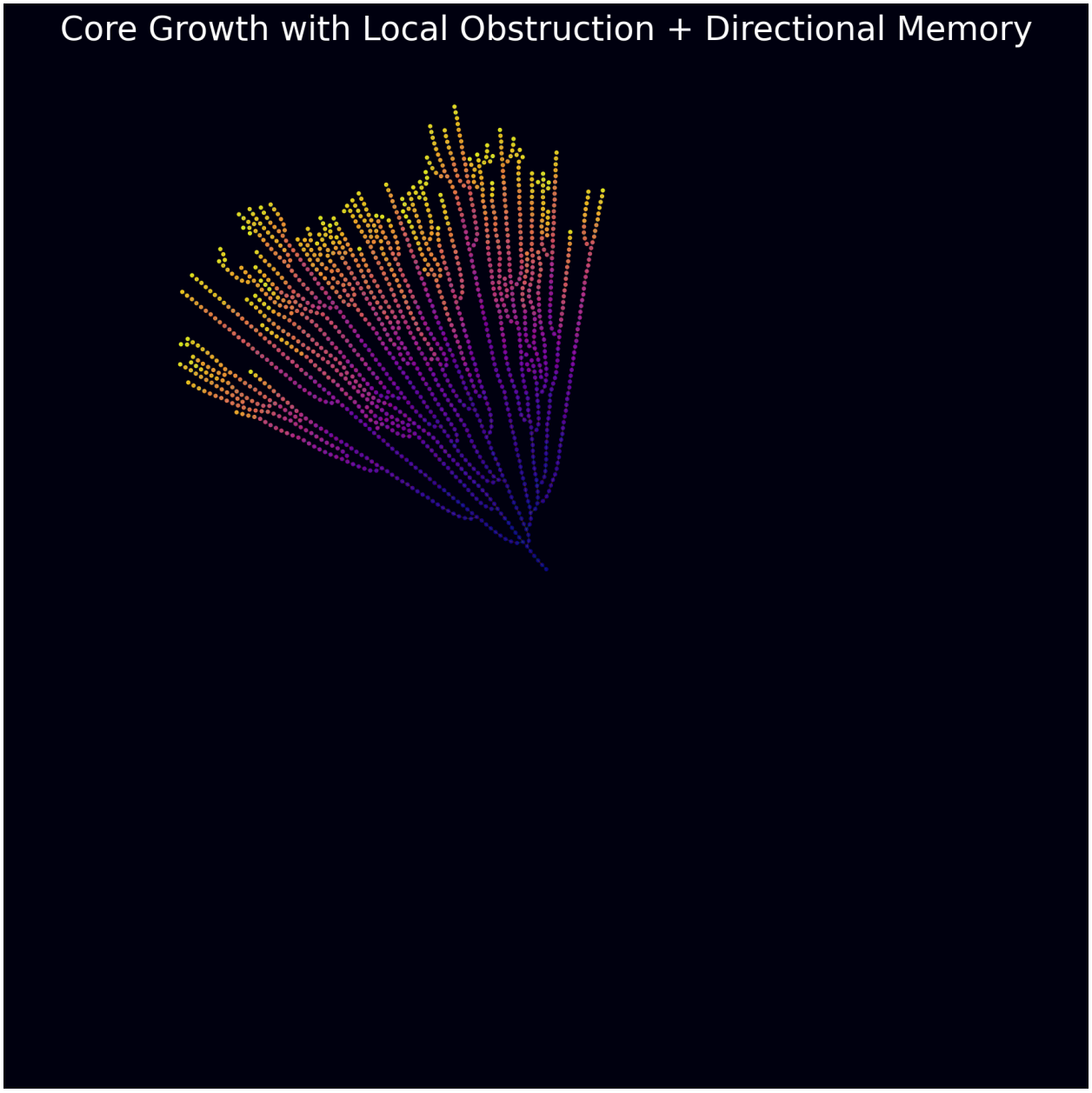

Figure 5. Emergent branching morphology from local growth rules.

All code, scenario-specific outputs, CSV files, charts, deterministic visualizations, and supplementary generated images for both the baseline and extended continuous-evolution simulation families are included in the single public code-deposit package: Sharma, V. S. (2025). L2-L3_Vijays_Law: Living-Only Simulations, Pattern Emergence, Branching Morphology, Code and Outputs. Zenodo. https://doi.org/10.5281/zenodo.19667609

Using the final reproducible seeded version of the code (random seed = 42), the 10,000-run baseline analysis produced the following results: standard inert/no-drive condition = 1.15%

high-stability success rate, mean final stability = 0.5000; Vijay's Law condition = 69.47% high-stability success rate, mean final stability = 0.6193; mean final stability difference = +0.1193.

Using the same final code at 100,000 runs, the results were: standard inert/no-drive condition = 0.96% high-stability success rate, mean final stability = 0.5001; Vijay's Law condition = 69.82% high-stability success rate, mean final stability = 0.6194; mean final stability difference = +0.1193.

A further large-collective robustness variant was then run by increasing the number of agents from 50 to 5,000 while keeping the total computational scale at 500,000,000 total agent-step updates by using 1,000 runs x 5,000 agents x 100 steps. Under this large-collective condition, the standard inert/no-drive model produced a 0.00% high-stability success rate, whereas the Vijay's Law condition produced a 100.00% high-stability success rate. Mean final stability remained 0.5000 for the no-drive condition and 0.6195 for the Vijay's Law condition, with a mean difference of +0.1195.

Starting from the 10,000-run, 50-agent baseline, the simulation therefore expands in two independent directions. Along the run-axis, while holding agents constant at 50 and increasing runs from 10,000 to 100,000, the standard inert/no-drive condition declines from 1.15% to 0.96%, while the Vijay's Law condition remains effectively stable, changing only from 69.47% to 69.82%. Along the agent-axis, while holding total computational scale at 500,000,000 total agent-step updates and increasing collective size from 50 agents to 5,000 agents, the standard inert/no-drive condition falls to 0.00%, whereas the Vijay's Law condition rises to 100.00%. This shows that as the model is scaled outward from the 10,000-run anchor in either direction, the inert model collapses toward failure while the Vijay's Law condition remains strongly above the same stability threshold and, at larger collective scale, becomes completely separable under the same criterion.

This is theoretically important because even the present implementation remains conservative relative to Vijay's Law itself. In the current simulation, the perpetuation term is fixed and mild, agents do not learn, do not reorganise into new structures, do not merge into higher cooperative forms, and do not increase their effective stability capacity over time. Under Vijay's Law, by contrast, matter participates in progressive manifestation from the simplest forms onward, and consciousness itself evolves, implying that the effective capacity for persistence should itself strengthen across scales and over time. The present simulation therefore under-implements Vijay's Law and still produces a decisive separation.

While the simulation does not by itself quantitatively prove the existence of a perpetuation drive, it does quantitatively show that in the absence of any intrinsic perpetuation term, stable high-organisation outcomes become extremely rare and trend downward with expanded sampling, indicating that matter treated as purely inert under repeated disturbance does not naturally sustain stable organised states and instead trends toward progressive destabilisation or collapse.

13. Proposed Experimental Tests

The following experimental protocols are proposed to provide direct testable predictions arising from the central claims of this paper. These tests are designed to be executable within current laboratory capabilities and are open for any suitable research group to undertake.

13.1 Bioelectric Opportunity-Field Test (Primary Proposed Experiment)

To directly test the central claim of latent perpetuation drive and graded agency, the following protocol is proposed. Young, healthy progenitor cells are used as the primary standardised condition because they provide the clearest and most directly interpretable response at the present stage of Anthrobot-style experimental design.

Hypothesis

Freed young cellular collectives will preferentially migrate toward and remain in a uniform micro-environment that maximises collective bioelectric integration (gap-junction formation and coherence) beyond what standard chemotaxis or random motility predict.

Materials and Methods

1. Generate standardised Anthrobots exclusively from young, healthy adult human tracheal epithelial progenitor cells following the Gumuskaya et al. (2023) protocol [82].

2. Prepare a microfluidic or agarose-gel arena with two adjacent uniform zones: Zone A (opportunity field): constant, uniform ion concentrations optimised for gap-junction formation (Ca^{2+}/K^{+} levels chosen to be chemotactically neutral). Zone B (control): neutral, uniform ion concentrations with no coherence advantage.

3. Release 50-100 Anthrobots at the boundary between zones.

4. Perform 50 independent trials (total ~5,000 collectives).

5. Image for 24-48 hours using time-lapse microscopy combined with voltage-sensitive dyes (e.g., DiBAC4(3)) for real-time bioelectric mapping.

Controls

Neutral arenas with identical conditions in both zones (random motility baseline). Chemotaxis-only gradients (nutrient gradient without coherence optimisation). Parallel simulation runs under standard physics (no drive term).

Primary Metrics

Time-integrated occupancy in Zone A vs Zone B. Collective coherence index = (average gap-junction density × motility synchrony). Mean residence time in the opportunity field.

Statistical Analysis

Two-tailed Mann-Whitney U or Kolmogorov-Smirnov test ($\alpha = 0.001$). Expected outcome under Vijay's Law: statistically significant bias toward Zone A (coherence index > 2× baseline). Expected outcome under standard models: no bias beyond random diffusion (occupancy ≈ 50% in each zone).

13.2 Young vs Old vs Detached Cell Comparison (Secondary Proposed Experiment)

A direct test of the prediction that all three cell types display a perpetuation drive, but the drive expresses differently once the cell is detached from (or never part of) the higher-order human form.

Hypothesis

Young, healthy Anthrobots will show significantly stronger preference for and longer residence time in the opportunity field (Zone A) than age-matched old/senescent cells or detached cells from the same donor tissue. All three populations will exhibit drive, but the mode and effectiveness will differ.

Materials and Methods

1. Obtain cells from the same human donor and prepare three parallel populations under identical conditions: young/healthy progenitor cells (standard Anthrobot protocol); old/senescent cells (induced by replicative senescence or from elderly donor tissue); detached cells: shed or detached epithelial cells that are still viable but no longer integrated in the organism (e.g., naturally exfoliated skin or airway cells).

2. Generate Anthrobots (or equivalent self-organising collectives) from all three populations using the exact Gumuskaya et al. (2023) protocol [82].

3. Run the identical Bioelectric Opportunity-Field Test protocol simultaneously on all three populations (50 trials each).

4. Compare the three groups under the same metrics.

Expected Outcome

Young cells: strong bias toward Zone A (coherence index > 2× baseline). Old/senescent cells: markedly reduced bias (closer to random motility baseline). Detached cells: different mode of drive expression (individual motility or alternative organisation instead of collective preference). Statistical test: two-tailed Mann-Whitney U between groups ($\alpha = 0.001$).

Note on detached cells

Cells conventionally labelled dead (such as shed skin cells or detached epithelial cells) are not truly lifeless. They have simply become detached from the higher-order human form. While integrated in the organism, their perpetuation drive served the collective structure. Once detached, the drive persists but is now expressed in a new, individual-cellular mode. This distinction is crucial: old or senescent cells still possess the fundamental drive, but its expression is altered because they are no longer active participants in the organism-level collective. The three-group experiment therefore tests not the presence or absence of the drive, but its mode and effectiveness once the cell is freed from the higher-order form.

14. Conclusion

This paper has established that the conventional assumption that matter is fundamentally dead and unconscious is not a demonstrated scientific conclusion, but an inherited interpretive position that has been repeated far more often than it has been proved. Across the full range of evidence examined here, no scientifically defensible boundary has been identified at which life or consciousness can be said to arise from true absence. Instead, the paper has shown a consistent pattern of continuity: the same matter persists, reorganises, and enters increasingly complex cooperative structures, while only its degree of integration, coordination, and expression changes.

The argument has been built through multiple independent but convergent lines of reasoning. The continuity argument shows that the human being, who undeniably exhibits life and consciousness, is materially continuous with earlier matter instead of composed of a separate substance. The composition argument shows that what is present in the larger form cannot coherently be treated as wholly absent in the constituent chain from which that form is built. The latency argument shows that properties may exist in real but less expressed form long before they become fully visible at a higher level of organisation. The epistemological limitation argument shows that the inability of current instruments or current models to detect a property at lower scales is not evidence of its true absence. The hydrogen to human argument sharpens the same conclusion by showing that once the material chain is traced to hydrogen, the simplest, the earliest atom, and once the chain is treated as materially continuous, no non-arbitrary point of ontological insertion remains available. The periodic table, read in the same framework, further shows that matter does not become different in essence as it develops into more complex elements and compounds; rather, the same underlying matter acquires increasingly differentiated cooperative and expressive potential.

The biological and empirical cases examined in this paper strengthen this conclusion instead of weaken it. Regeneration, distributed control, colony-level organisation, edge-case life forms, behavioural persistence, and forms of adaptive response that exceed simplistic mechanical expectation all converge on the same inference: what conventional biology often treats as isolated anomalies are better understood as evidence that life and consciousness are already present in graded form across matter, and become increasingly organised, centralised, or recognisable in more complex structures. These cases do not stand as decorative exceptions. They materially support the core thesis by repeatedly showing that the boundary between the supposedly living and the supposedly non-living, or between the supposedly conscious and supposedly unconscious, is far less absolute than the standard view requires.

The standard emergence view also carries a deeper inconsistency that is often ignored. It speaks of consciousness as though it were a single property that conveniently appears once matter becomes sufficiently complex, yet the observable world shows no such simplicity. Consciousness does not appear in one uniform form. It appears in vastly different degrees, structures, intensities, behavioural expressions, perceptual ranges, memory architectures, motivational systems, emotional capacities, and modes of response across species and across individuals. The number of such combinations is not merely large, but unfathomably vast, and new instances of these differentiated conscious forms arise continuously through reproduction across the living world. In effect, the emergence model does not explain one consciousness appearing once. It requires countless distinct forms of consciousness, in astronomically large combinations, to arise repeatedly and continuously

from matter across living systems. That does not simplify the problem. It magnifies it. A framework in which consciousness is fundamental, graded, and differentially expressible across matter is therefore not only more coherent philosophically, but far more consistent with the actual diversity and continual recurrence of conscious life observed in nature.

The Monte Carlo Perpetuation Simulation now provides two independent computational confirmations of the same conclusion in minimal form. The baseline short-cycle model shows that when matter is treated as purely inert under repeated disturbance, stable high-order organisation becomes vanishingly rare and trends downward with scaling, whereas the inclusion of even a minimal perpetuation term produces robust stability across both extended-run and large-collective expansions. The extended continuous-evolution stress tests then show the same separation under much harsher and more standard-model-favorable assumptions, including repeated mutation-like shocks across the same tracked population, reduced conscious-drive baselines, larger mutation amplitudes, and selective adverse-only stress on Vijay's Law populations. Across these varied conditions, intrinsic perpetuation drive remained the decisive determinant of durable above-threshold persistence.

The additional local-rule pattern-formation simulations further reinforce this logic by showing that coherent natural-looking large-scale forms can arise from decentralised local perpetuation-like behaviour without any globally pre-coded target geometry.

Taken together, these arguments do not merely suggest but strongly support a single coherent conclusion: life and consciousness are not late emergent accidents imposed upon dead matter. They are fundamental, universal, and graded features of reality, present throughout matter and progressively manifested through organisation, cooperation, and structural evolution. What changes across scales is not whether life and consciousness exist, but how fully they are integrated, expressed, and made observable. The standard model of dead matter giving rise to life and consciousness from true absence therefore remains not an established scientific result, but an unproven assumption. The more coherent interpretation, supported by the arguments developed in this paper, is that all matter is alive and conscious in varying degree. This conclusion provides the necessary foundation for the next paper, where evolution is examined not as the rise of life from inert substance, but as the progressive manifestation of living, conscious matter through structured transformation and cooperation.

Two later papers in this programme, Paper 20 [103] and Paper 21 [104], extend the argument of the present paper from a qualitative claim into a quantitative, testable framework, proposing that the four fundamental forces of physics form a hierarchical structure of physical sensing channels, and introducing a scalar Consciousness Index built on that structure and calibrated across a wide range of biological systems. Section 6.2 above summarises this extension; the present paper's conclusion should be read together with those results as a single, developing line of argument instead of as a finished and closed position.

For additional illustrative biological examples consistent with the present framework, see Appendix A (Biological Evidence Catalogue).

APPENDIX A: Biological Evidence Catalogue

A Catalogue of Biological Evidence Consistent with Universal Life and Consciousness

The following appendix presents a structured catalogue of documented biological cases consistent with the central claim of this paper that life and consciousness are fundamental and graded properties of matter. These examples are not presented as isolated proofs of the full theory, but as convergent empirical cases that repeatedly challenge conventional assumptions about the boundaries of life, sensing, memory, agency, adaptation, and environmental requirement. They are illustrative instead of exhaustive, and many also support the evolutionary argument developed more fully in the next paper.

A. Attack, Defence, and Survival Systems

Electric Eel

Possesses specialised electric organs producing high-voltage discharge for attack and defence, and lower-voltage discharge for navigation and communication. The entire body architecture is reorganised around electrical capability, anatomy, physiology, neural control, and ecological deployment functioning as one integrated system. Principle: life exploiting an available physical principle to build a complete survival strategy. [10]

Weakly Electric Fish

Use self-generated electric fields for navigation, communication, mate recognition, territorial signalling, and object detection. Not merely a trait, an entire sensory world built around a physical principle. Principle: life constructing a complete alternative mode of perception and ecological engagement. [11]

Sharks and Rays: Electroreception

Detect the weak electrical fields produced by the muscle activity of hidden prey, turning an invisible physical property of the environment into hunting information. Principle: life expanding the informational reach of its senses into physical dimensions inaccessible to competitors. [12]

B. Root Intelligence and Distributed Coordination

Darwin's Root-Brain Hypothesis Overturned: Distributed Intelligence
Root systems sense gradients of moisture, nutrients, toxins, gravity, compaction, neighbours, and obstacles, then alter growth architecture in ways that optimise resource acquisition and survival. This coordinated problem-solving occurs without a central nervous system, distributed across thousands of root apexes operating collectively. Charles Darwin proposed that the root apex functions as the plant's informational centre. Modern work has confirmed the directional intuition while replacing the centralised model with a distributed one, now characterised by researchers as swarm intelligence - the same leaderless coordination seen in bird flocking and insect colonies. Principle: cognition-like integration can exist without a central organiser, supporting the broader claim that consciousness and intelligence are graded and widely distributed properties of matter instead of privileges of complex nervous systems. [44, 45, 66, 67]

C. Plant Intelligence and Strategic Behaviour

Venus Flytrap: Threshold Decision

Uses trigger hairs requiring two stimulations within a time window before closing, conserving energy by not responding to meaningless single contacts, and ensuring closure only when prey is present. Principle: threshold-based discrimination and economy of action, the logic of decision without a nervous system. [13]

Sundews: Adhesive Predation

Produce sticky mucilage droplets on tentacles that resemble nectar, trap insects, and then bend surrounding tentacles inward to maximise contact and digestion. Principle: multi-stage active predation in a sessile organism. [14]

Pitcher Plants, Pitfall Architecture

Construct fluid-filled chambers with inward-directed hairs, waxy walls, and digestive fluid, luring insects to a trap they cannot escape. Principle: architectural predation, a structure designed around the mechanics of prey capture and retention. [15]

Bladderworts, Suction Traps

Maintain sub-atmospheric pressure in tiny bladders that spring open when trigger hairs are touched, sucking in prey in fractions of a millisecond. Among the fastest movements in the plant kingdom. Principle: mechanical engineering in service of predation, operating faster than any vertebrate reflex. [16]

Mimosa pudica: Habituation-Like Modulation

Folds leaves when touched as a defence, but repeated harmless touching reduces the response, conserving energy when the stimulus proves non-threatening. A learning-like phenomenon with no

nervous system. Principle: behavioural modulation based on repeated context, memory-like adjustment without neurons. [17]

Dodder: Host Detection and Selection

A parasitic plant that detects chemical cues from potential hosts and grows toward preferred hosts over less suitable ones, demonstrating preference, target selection, and directed behaviour before physical contact. Principle: chemosensory decision-making in a plant. [18]

Climbing Plants: Slow-Motion Search

Circle, probe, detect supports, redirect growth, attach strategically, and reinforce where needed. Speeded up, this behaviour is indistinguishable from exploratory action. Principle: directed environmental search expressed at a timescale humans underestimate. [19]

Acacia-Ant Mutualism

Acacias produce nectar, food bodies, and hollow thorns as shelter. Ants defend the acacia against herbivores and remove competing vegetation. Both parties invest and both benefit. Principle: a structural alliance embodied in the morphology of both partners, mutual conscious cooperation frozen into form. [20] [35, 36]

Orchids: Pollinator-Specific Reproductive Engineering

Many orchid species show precise floral shapes targeted to specific pollinators, timed scent release, pollen placement on exact body parts, and in some cases sexual deception, mimicking female insects to induce mating behaviour in male pollinators. Principle: reproductive strategy of extraordinary precision, exploiting the neurobiology of another species. [21]

Desert Plants, Coordinated Survival Architecture

Combine water storage, waxy surfaces, reduced leaves or spines, night-opening stomata, reflective surfaces, drought-resistant dormancy, and timed flowering into a coordinated doctrine for survival. Not isolated traits, a complete strategic adaptation to a harsh environment. Principle: integrated multi-system adaptation to extreme conditions, where every trait exists in functional relationship to every other, expressing a unified survival strategy built into the organism's form. [22]

Mangroves, Compound Solutions to Compound Problems

Simultaneously address salt stress, unstable substrate, oxygen-poor soil, and tidal fluctuation through salt exclusion or excretion, pneumatophores, aerial roots, prop roots, and buoyant propagules. Each challenge has a solution; the solutions function together. Principle: multi-problem problem-solving. [23]

Allelopathy, Chemical Suppression of Competitors

Some plants release chemicals into the soil that inhibit the germination or growth of nearby competing plants. Principle: ecological agency exercised chemically, reshaping the competitive landscape instead of merely enduring it. [24]

Maize - Airborne Warning and Collective Defence

When attacked by herbivores, maize plants release specific airborne chemical compounds - most critically indole - that neighbouring unattacked plants detect and respond to by activating their own defence systems before any attack reaches them. The signal is species-specific, travels up to three metres, and can reduce herbivory by more than 90%. The attacked plant is not merely defending itself. It is warning its neighbours. Principle: awareness of threat, communication of that threat to others, and coordinated collective defence in organisms with no nervous system. [42]

Plants - Targeted Third-Party Communication: Calling the Predator of the Predator

When attacked by caterpillars, multiple plant species - including maize, cotton, and tobacco - release blends of 10 to 12 volatile compounds that are specific to the species of caterpillar attacking them. These signals attract the parasitic wasps that prey on exactly those caterpillars. The plant identifies its attacker, selects the appropriate signal, and directs that signal at a specific third party capable of eliminating the threat. Specialist wasps can distinguish signals from their specific host caterpillar from those of closely related non-host species. Principle: threat identification, targeted communication directed at a specific ally, and coordinated three-party defence - all executed without a nervous system. [43]

Charles Darwin proposed that the root apex functions as a centralised command centre directing all plant behaviour - a brain-like structure in the soil. Modern plant neurobiology has both partially confirmed and decisively revised this intuition. Root apexes do process and integrate environmental information, and electrical network activity in root apex zones has been recorded and documented. But there is no single central organiser. Instead, thousands of root apexes coordinate their behaviour collectively, exhibiting what researchers have termed swarm intelligence - the same distributed, leaderless coordination seen in bird flocking and insect colonies. The network is resilient precisely because nothing is in charge. Darwin's intuition that roots are the informational centre of plant life was directionally correct. His assumption that this required a centralised command post was wrong. Purposeful, adaptive, coordinated behaviour can emerge from distributed matter with no single point of control. Principle: intelligence does not require a centre. It requires only that each unit responds to its environment and communicates with its neighbours. [66, 67]

Plant Kin Recognition and Altruism Toward Genetic Relatives

When the roots of Impatiens pallida come into contact with roots from an unrelated plant, the impatiens increases its competitive behaviour - producing larger leaves and consuming more water and light. When its roots contact a genetic relative, the competitive response is reduced. The plant effectively sacrifices some immediate competitive advantage in favour of a family member. The

reason is that helping a relative also perpetuates shared genes - the same objective as self-perpetuation, achieved through a different form. The individual does not need to survive or dominate if the kind continues through the relative. This is not sentimental altruism. It is the drive toward perpetuation operating at the level of shared genetic material instead of individual form - expressed in a plant, through roots, without a brain. Principle: the drive toward perpetuation operates at the level of the kind, not merely the individual form. A unit of matter will accept reduced competitive advantage when the continuation of its kind is secured through another route. [46]

Underground Nematode Recruitment Against Root Predators

When maize roots are attacked by Diabrotica corn rootworm larvae burrowing inside the root tissue, the damaged roots release a specific chemical signal underground. This signal is detected by entomopathogenic nematodes - organisms less than one millimetre in length - which navigate toward it across distances of up to half a metre, equivalent to 500 times their own body length, locating and killing the root predator. The plant cannot move. It cannot fight the attacker directly. Instead it identifies the threat, selects the appropriate signal, releases it into the soil, and guides a specific ally to the exact location of the predator. This is below-ground strategic ally recruitment - the underground equivalent of the above-ground wasp-calling behaviour, and equally precise. Principle: indirect defence through targeted third-party communication, executed without a nervous system, below the surface, in complete darkness. [47]

Plant Stress Memory: Prior Experience Changes Future Response

Plants exposed to low doses of a stressor and later challenged with high doses of the same stressor survive significantly better than plants with no prior exposure. The prior experience produces measurable changes at the root level that persist and improve the plant's later response to the same threat. This is biological memory without a brain. The plant encountered a problem, encoded something from that encounter, retained it, and applied it when the problem returned at greater intensity. Principle: living matter can store prior experience and retrieve it adaptively - not as neural memory but as modified cellular state - demonstrating that memory-like function is a property of life at every scale, not a privilege of nervous systems. [48]

Plants Relay Stress Signals to Unstressed Neighbours

When one group of plants is subjected to stress, they emit chemical signals that neighbouring unstressed plants detect and respond to by activating the same protective gene responses - before the stress reaches them. The relay of stress signals between plants has been documented across multiple stress types and across species boundaries. Unstressed plants prepare for a threat they have not yet encountered, based solely on the signal from their neighbours. This is anticipatory collective defence: one group broadcasting distress, another group receiving, interpreting, and preparing. Principle: coordinated pre-emptive response across individuals with no physical connection and no nervous system - collective awareness in matter. [49]

Caterpillar Saliva Identified as the Trigger: Plants Recognise the Attacker, Not Just the Wound

When a caterpillar chews a corn leaf, the plant's response is not triggered by physical damage alone. The plant detects specific compounds in the caterpillar's saliva and responds to the identity of the attacker, not merely the wound. The signal produced in response to caterpillar saliva is chemically distinct from that produced by equivalent mechanical damage, and it is this identity-specific signal that attracts the parasitic wasp. The plant recognises what is eating it. Principle: identification of the specific attacker through chemical recognition, followed by a targeted response calibrated to that specific threat - not a generic alarm but attacker-specific intelligence in a plant with no brain. [50]

Plants Detect and Respond to Vibration and Sound

Plants possess no ears but are covered in mechanosensitive channels - molecular sensors that respond to mechanical vibration. Research has documented that plants detect and respond to sound frequencies, with roots showing early signalling events following sound perception. Plants use vibrational information from the soil to assess water availability, soil structure, and the presence of obstacles. The frequency range plants respond to most strongly falls between approximately 100 and 1,000 Hz. This sensory capacity operates continuously and requires no nervous system. Principle: environmental sensing through a distributed network of mechanical receptors embedded throughout the plant body, providing spatial and environmental awareness at every point of contact with the world. [51, 52]

Plants Emit Sounds

Corn roots emit weak clicking sounds detectable by laser under experimental conditions - among the first recorded instances of plants generating acoustic output. Plants under stress have separately been documented emitting airborne ultrasonic sounds informative of their stress state. Plants are not merely passive receivers of environmental information. They produce detectable acoustic signals. Principle: plants are active emitters as well as receivers - broadcasting information into their environment through multiple channels simultaneously, including channels humans cannot ordinarily perceive. [53]

Plants Have More Chemical Receptors Than Humans

A simple plant possesses at least 600 different types of receptors for detecting chemical compounds in its environment. Humans have fewer than 20 types of such receptors. In terms of chemical environmental sensing, plants are not impoverished versions of animals. They are extraordinarily more sensitive. They perform chemical detection of exceptional precision - without a brain and without a nervous system. Principle: sensory richness is not a privilege of complex nervous systems. Matter in stable organised form develops whatever sensing apparatus best serves its drive toward perpetuation - and for sessile organisms that cannot run from threats, chemical sensing of exceptional range and precision is the result. [54]

Proportional Defence: Signal Strength Varies with Survival Stakes

When corn plants are attacked by caterpillars, smaller plants emit significantly stronger chemical distress signals than larger plants facing the same threat. A single caterpillar can kill a small plant but poses a lesser proportional threat to a large one. The signal is not a fixed reflex. It is calibrated.

The plant assesses its own vulnerability relative to the threat and adjusts the intensity of its response accordingly. Principle: variable, proportional response based on an assessment of survival stakes - not mechanical reflex but a graded output matched to the severity of the situation as it applies to that specific organism at that specific moment. [43]

Arms Race: Plant Defence Forces Caterpillar to Change Feeding Strategy

Corn plants release their wasp-attracting volatile signals during daylight hours, when photosynthesis is active. Caterpillars that feed on corn have responded over evolutionary time by shifting their feeding to night, when the plant's signalling system is weakest and wasps are not active. The plant developed a defence. The caterpillar evolved a counter-strategy. The plant's defence system shaped the behaviour and ecology of its predator. Principle: reciprocal adaptive pressure between life forms, each driven by the same underlying drive toward perpetuation, producing a dynamic co-evolutionary arms race observable in present behaviour - not ancient history but a living interaction. [43]

Common Chemical Vocabulary Across Life: Signal Sharing Between Kingdoms

The chemical molecules plants use to communicate with each other and to attract or repel insects are biochemically related to signalling molecules found in insects and animals - including compounds analogous to hormones used in mammalian systems. The same basic chemical vocabulary of life has been conserved and repurposed across kingdoms. This is not coincidence. It reflects the continuous underlying nature of living matter: the same fundamental drive toward perpetuation, expressed through chemistry that did not need to be reinvented at every new scale of complexity because it was already present in the matter from which every living form is built. Principle: chemical signalling is not separately invented by plants, insects, and animals. It is shared, adapted, and redirected - evidence that all life operates through the same underlying substrate, using the same molecular language in different dialects. [55]

D. Parasitic Manipulation, The Strongest Category of Evidence

Leucochloridium paradoxum: Zombie Snail

Enters snail via bird droppings; develops pulsating broodsacs in snail tentacles resembling prey items; alters snail behaviour to remain exposed; attracts birds to peck tentacles; completes transfer to required avian host. Multi-stage, future-dependent, host-manipulating life cycle executed by an organism with no brain. Principle: multi-host life cycle engineering, in which the parasite reshapes two separate organisms' bodies and behaviours in sequence to complete a single reproductive strategy. [3]

Hairworms (Nematomorpha)

Infect terrestrial insects such as crickets, develop inside them, then, when mature, alter host behaviour so that the host approaches and enters water, enabling the hairworm to emerge into its required aquatic environment. The host's behaviour is directed toward a specific environmental transition it would not otherwise make. [25]

Lancet Liver Fluke: Dicrocoelium dendriticum

Passes through snails and ants; infected ants are manipulated to climb grass tips at dusk and clamp there, increasing the probability of being eaten by grazing mammals, the fluke's required definitive host. Behavioural control timed to the grazing patterns of the next host. [26]

Ophiocordyceps unilateralis, Zombie Ant Fungus

Causes infected ants to climb to a precise height, bite leaf veins at a location optimal for sporulation, and die there. Achieves behavioural control without invading the brain, instead forming networks around muscle fibres throughout the body. Principle: distributed muscle-level behavioural override, achieving precise postural and positional control of a complex animal organism without ever entering its central nervous system. [4, 8]

Toxoplasma gondii

Converts rodent aversion to cat pheromones into attraction, specifically and selectively, increasing the probability of cat predation and thus transfer to the feline definitive host. Achieves this through dopamine pathway manipulation using its own molecular analogues of mammalian enzymes. Principle: neurochemical rewriting of a specific fear response, selectively inverting a single instinct while leaving other behaviours intact, to engineer predation by the required host. [5]

Emerald Cockroach Wasp (Ampulex compressa)

Stings a cockroach in two specific neural locations with surgical precision, first to temporarily disable a front leg, then to deliver a second sting that induces a docile, compliant state. The wasp then leads the cockroach by its antenna to a burrow where it lays an egg on it. The cockroach remains alive and does not attempt to escape. Neural intervention, behavioural suppression, and reproductive foresight combined. Principle: targeted neurological surgery performed by a predator organism on its prey, achieving not death but controlled docility, to serve as a living food supply for offspring. [27]

Cotesia congregata: Bodyguard Caterpillar

Injects eggs and immune-suppressing bracovirus into caterpillar hosts; larvae develop inside living host without killing it prematurely; larvae emerge and spin cocoons externally; caterpillar becomes a non-feeding bodyguard defending cocoons against hyperparasitoids. Brain changes correlating with bodyguard behaviour documented in peer-reviewed research. Principle: complete repurposing of a host organism from prey to guardian, with documented brain-level changes sustaining the new behavioural role after the parasite has already departed. [6, 9]

Sacculina: Crab Reproductive Hijack

Parasitic barnacle infects crabs, castrates them, alters their hormonal and behavioural patterns, and manipulates them into caring for the parasite's brood as if it were their own offspring, commandeering parental behaviour at its most fundamental level. [28]

Euhaplorchis californiensis

Manipulates fish to swim near the water surface and display conspicuous behaviours that increase predation probability by birds, the parasite's required next host. Behaviour change is specific to the transmission route required. [29]

Schistocephalus solidus

Infects stickleback fish and alters their behaviour in ways that increase predation by birds, completing the parasite's life cycle. The altered behaviour is specifically targeted to the route of transmission. [30]

E. Distributed and Collective Intelligence

Honeybees: Consensus Decision-Making

Scout bees communicate the quality and location of potential nest sites through the waggle dance. Multiple scouts compete through dance intensity and duration. The colony reaches consensus through a process resembling democratic deliberation, with quorum sensing triggering the swarm's departure. Principle: distributed decision-making producing collective intelligence without central control. [31]

Termite Mounds: Climate Engineering

Provide ventilation, temperature regulation, humidity control, and structural resilience through collective construction following local rules. Internal temperatures are maintained within narrow ranges despite extreme external variation. Principle: architectural climate engineering by organisms with brains smaller than a grain of rice. [32]

Spiders: Architectural Engineering Through Silk

Spiders construct webs of extraordinary geometric precision - orb webs, funnel webs, cobwebs, and sheet webs - each calibrated to the hunting strategy and ecological niche of the species. Web architecture is not a fixed genetic template but an adaptive construction that responds to available anchor points, prey type, vibration patterns, and environmental conditions. Individual web components are engineered for specific functions: radial threads for structural support, spiral threads for prey capture, signal threads for detecting prey movement. Web design encodes the full ecological intelligence of the organism in a physical structure. Principle: life externalises its adaptive intelligence into architecture, building a physical extension of its own body and strategy into the environment. [33, 34]

F. Sensory Worlds and Adaptive Reallocation

Cave Fish: Sensory Reallocation

Species that have inhabited cave environments over evolutionary time show reduction or loss of eyes alongside enhancement of lateral line mechanoreception and other non-visual senses. The body reallocates resources from a useless sense to useful ones. Principle: conscious resource

management expressed in morphology - the same matter, in a different context, redirecting its available capacity toward what perpetuation requires. [40] [38, 39, 41]

G. Life in Impossible Conditions: Evidence That Vijay's Law Holds Beyond Earth-Standard Requirements

The following examples each represent life expressed under conditions that standard definitions of life would predict to be impossible - no oxygen, no sunlight, no liquid water, temperatures at the extreme of physical tolerance, radiation doses lethal to all other known organisms, complete desiccation, or geological isolation measured in hundreds of millions of years. Each case directly supports Vijay's Law: life and consciousness are properties of matter itself, not requirements imposed by surface-Earth conditions. They are expressed wherever the conditions for stability exist - and sometimes even where conventional science assumed they did not.

Tardigrades: Life Survives the Vacuum of Space

Tardigrades, microscopic animals less than one millimetre in length, were sent into low Earth orbit in 2007 and exposed to the full vacuum of space, unfiltered solar radiation, and cosmic radiation for ten days. On return to Earth, survivors were rehydrated and resumed normal life. They can also survive temperatures from -272°C to 150°C, radiation doses 1,000 times lethal to humans, complete desiccation for decades, and pressures from the vacuum of space to the deepest ocean trenches. When desiccated, metabolism is completely suspended. No chemical reactions occur. No biological processes operate. On rehydration, full function resumes. This is not merely hardiness. It is life suspended - consciousness in matter, waiting for stability to return. Principle: life does not end under conditions of extreme physical stress. It pauses. The drive and the capacity remain intact in the matter itself. [56]

Deinococcus radiodurans: Life Reassembles Its Own Shattered Genome

Deinococcus radiodurans survives radiation doses that would shatter the DNA of any other known organism into hundreds of fragments - doses more than 1,000 times lethal to humans. After exposure, it systematically reassembles its own fragmented genome, piece by piece, within hours, and resumes normal function. It also survives desiccation, acid, and oxidative stress that destroys other cells. This bacterium was discovered in canned meat that had been sterilised by radiation and still contained viable organisms. Principle: matter can retain the information and drive needed to reconstruct itself, even after physical destruction of its informational substrate. The capacity for life was not destroyed by the radiation. It was suspended, and the matter rebuilt what was needed to express it again. [57]

Candidatus Desulforudis audaxviator: Life Without Sunlight, Oxygen, or Surface Connection

Discovered 2.8 kilometres underground in a South African gold mine, Candidatus Desulforudis audaxviator lives in complete absence of sunlight, organic compounds, and oxygen, at temperatures exceeding 60°C, in highly alkaline water that has had no contact with the surface for millions of years. It derives all its energy from the radioactive decay of uranium and thorium in the surrounding rock, using the hydrogen and sulphur compounds produced by that decay as its sole

energy source. It is the only known organism that forms a complete single-species ecosystem with no dependence on any other life form and no connection to the surface biosphere. It has since been found in geographically isolated deep subsurface locations across three continents, with greater than 99.2% genetic identity across samples separated by thousands of kilometres - suggesting it has remained essentially unchanged for millions of years. Principle: life requires none of the conditions conventionally listed as prerequisites. It requires only stable matter and a source of energy. Where those exist, life expresses itself. [58]

Deep-Sea Hydrothermal Vents: Entire Ecosystems Without Sunlight

Hydrothermal vents on the deep ocean floor, first discovered in 1977, support dense, diverse ecosystems at depths of 2,000 to 4,000 metres, in complete darkness, at pressures 200 to 400 times atmospheric, and adjacent to water jets exceeding 400°C. Life here does not run on sunlight. It runs on chemosynthesis - bacteria that derive energy from the chemical reactions between superheated mineral-rich water and cold seawater, forming the base of food chains that include tube worms over two metres long, eyeless shrimp, giant clams, and crabs. These ecosystems were unknown to science until 1977 because it was assumed that all life ultimately depended on solar energy. They do not. Principle: life invents entirely new energy strategies when the standard ones are unavailable. The drive toward perpetuation finds whatever physics offers and builds from it. [59]

Halophiles: Life Thriving in Conditions That Destroy Cells

Halophilic archaea thrive in salt concentrations five to ten times that of seawater - conditions that would cause immediate plasmolysis and death in standard cells. The Dead Sea, the Great Salt Lake, and natural salt flats that appear utterly lifeless to the naked eye contain dense microbial communities of halophiles, many of them visually detectable as the pink or red coloration they produce. Some are found preserved and revivable in ancient salt deposits millions of years old. Principle: what destroys standard cellular organisation does not destroy life. It merely filters which forms of life are expressing themselves in that substrate. The capacity is present in matter at far wider ranges of physical condition than standard biology acknowledges. [60]

Antarctic Icefish: Life Without Haemoglobin

The Antarctic icefish are the only known vertebrates with no haemoglobin and no functional red blood cells. Their blood is transparent. They survive in sub-zero waters where the freezing point of seawater is overcome by antifreeze glycoproteins that prevent ice crystals from forming in their tissues. They absorb oxygen directly through their skin and through the walls of an unusually large heart that pumps a high volume of thin, oxygen-dissolved blood. They violate every assumption about how vertebrate circulation must work. Principle: life does not need any particular molecule or mechanism. It needs to solve the problem of perpetuation in its specific physical context, and it will solve it with whatever materials and physics are available. [61]

Seed Dormancy: Life Suspended for Thousands of Years

A sacred lotus seed recovered from a dry lakebed in China, radiocarbon dated to approximately 1,300 years old, was successfully germinated and grew into a healthy plant. Date palm seeds from

the Judean Desert, dated to approximately 2,000 years old, have also been germinated successfully. During dormancy, seeds show no metabolism, no growth, no response to stimuli, no reproduction - every criterion of the standard biological definition of life is absent. Yet the capacity for life is entirely intact, waiting only for water, warmth, and light to resume expression. The standard definition of life cannot accommodate this. This framework does: the seed is alive during dormancy. Its consciousness is suspended, not destroyed, exactly as this framework predicts matter in unpredictable or inert conditions would be. Principle: millennia-scale life suspension, demonstrating that the complete absence of all biological activity does not constitute death but a form of arrested expression, with the full capacity for life preserved intact in the material substrate. [62]

Bacterial Spores Revived After 250 Million Years

In 2000, Vreeland and colleagues reported the revival of a bacterium from a fluid inclusion inside a primary salt crystal from the Salado Formation in New Mexico, dated to approximately 250 million years old. The bacterium had been encased in the crystal since the Permian period, preceding the dinosaurs. On extraction and rehydration in a laboratory, it resumed growth. The controversy around this finding - whether contamination could be excluded - does not invalidate the extraordinary range of similar findings: bacterial spores have been reliably revived from salt crystals dated to tens of thousands of years, and from amber inclusions, across multiple independent studies. Principle: life in spore form can persist through geological time, suspended but intact, in matter that to all appearances is simply mineral. [63]

Bdelloid Rotifers: Life That Survives Radiation, Desiccation, and Freezing Repeatedly

Bdelloid rotifers - microscopic aquatic animals - can survive complete desiccation, extreme radiation, freezing, and the vacuum of space. They can be desiccated and rehydrated thousands of times across a lifespan. When desiccated, all biological activity ceases entirely. On rehydration, full function resumes within minutes. They show exceptional resistance to ionising radiation - far beyond what their DNA repair mechanisms would predict - apparently by extensively borrowing and incorporating DNA from bacteria, fungi, and plants through horizontal gene transfer, building a patchwork genome from the wider community of life around them. Principle: individual organisms can actively incorporate genetic material from the broader living world, blurring the boundary between individuals while demonstrating that the drive toward perpetuation operates at every available scale and through every available strategy. [64]

Nematodes Revived After 46,000 Years in Permafrost

In 2023, Shatilovich and colleagues reported the successful revival of nematode worms from Siberian permafrost samples dated to approximately 46,000 years old, confirmed by radiocarbon dating of the surrounding organic material. The worms resumed feeding and reproduction after thawing. This is the longest demonstrated period of suspended animation in a multicellular animal - 46,000 years of complete biological inactivity, followed by full resumption of life. Principle: complex multicellular animals, not merely bacteria or spores, can have their life suspended for geological

timescales and resume it when conditions return. The life was not absent during those 46,000 years. It was waiting in the matter, exactly as this framework predicts. [65]

Viruses: Strategic Life at the Boundary of Living and Non-Living

Viruses have no metabolism of their own, cannot reproduce without a host cell, and when isolated exist as inert crystals indistinguishable from non-living matter. The standard biological definition of life excludes them. Yet outside a host they wait - in some cases for centuries in permafrost or dry conditions - and on contact with an appropriate host cell, execute an extraordinarily precise sequence: identification of the correct cell type, attachment to specific surface receptors, injection of genetic material, hijacking of the host's cellular machinery, replication, assembly of new particles, and coordinated escape. Giant viruses, discovered in the early 2000s, contain more genes than many bacteria and carry their own DNA repair and translation machinery. Principle: the boundary between living and non-living is not a sharp line. It is a threshold of expressed complexity. Viruses demonstrate that the properties associated with life - strategic behaviour, targeted interaction, replication drive - can be present in matter without continuous metabolic expression. [66]

Prions: Replication Without DNA or RNA

Prions are misfolded proteins. They carry no genetic material - no DNA, no RNA - yet they replicate. When a prion contacts a normally folded version of the same protein, it induces that protein to adopt the misfolded conformation. The misfolded protein then induces further misfolding in neighbouring proteins. The prion propagates through a tissue or organism by converting normal matter into copies of itself - without any genetic blueprint and without any metabolic support beyond the substrate of correctly folded proteins available in the host. Prions cause fatal neurodegenerative diseases including CJD, scrapie, and BSE. They can survive autoclaving, ultraviolet radiation, and chemical sterilisation that destroys all known conventional pathogens. Principle: replication - the most fundamental property of life - can occur without a genetic molecule of any kind, driven purely by the conformational drive of matter to propagate a specific structural pattern. [67]

Slime Moulds: Single Cells Solving Spatial Problems Collectively

Physarum polycephalum, a slime mould, is technically a single cell with multiple nuclei. When food sources are placed in a maze, it extends pseudopods through all possible routes simultaneously, then systematically withdraws from dead ends and reinforces successful routes, solving the maze without a nervous system or brain. In a landmark 2000 experiment published in Nature, a slime mould solved a maze to find the most efficient connection between food sources. In subsequent studies, when food was placed at positions corresponding to cities around Tokyo, the network of connections the slime mould produced closely resembled the actual Tokyo rail network - one that took human engineers decades to optimise. Principle: a single cell without a brain can solve spatial optimisation problems that challenge human engineering. Intelligence - or at least its functional equivalent - is a property of living matter, not a privilege of nervous systems. [68]

Mycelial Networks: The Underground Internet of Forests

Fungal mycelial networks connect the root systems of trees across entire forests, transferring carbon, nitrogen, water, and chemical signals between trees of the same and different species. Simard and colleagues demonstrated in 1997 that carbon fixed by birch trees through photosynthesis was transferred via mycorrhizal networks to shaded Douglas fir seedlings that could not produce sufficient carbon themselves. Stressed or dying trees increase their carbon transfer to neighbours. Young seedlings connected to established trees receive nutrients that significantly improve their survival rates. The network is not passive plumbing. It responds dynamically to need, priority, and ecological conditions across the entire connected system. Principle: life operates as a network at the scale of entire forest ecosystems, transferring resources and information through matter that most observers regard as soil. [69]

Endolithic Organisms: Life Living Inside Rock

Endolithic organisms - bacteria, algae, fungi, and lichens - live inside rocks, between mineral grains, in crystal lattices, and beneath the surface of translucent minerals, conducting photosynthesis through the rock using the small fraction of light that penetrates. They were first documented in Antarctic sandstone in 1982 by Friedmann, who found green and pink layers of photosynthetic organisms one to two millimetres below the rock surface, protected from desiccation, UV radiation, and temperature extremes by the rock itself. Endolithic communities have since been found in rocks across every continent and at every altitude. Principle: life finds stability wherever the physical conditions permit it, including inside what is conventionally regarded as inert mineral matter. The boundary between the living and the geological is not where conventional biology places it. [70]

Mariana Trench: Life at the Deepest Point of the Ocean

At 11 kilometres depth in the Mariana Trench, under pressures of approximately 1,100 atmospheres - 1,100 times the pressure at sea level - diverse communities of microorganisms, crustaceans, polychaete worms, and sea cucumbers live and reproduce. The pressure at these depths would instantly destroy the cellular structure of surface organisms. Food arrives only as marine snow - the slow fall of organic debris from the surface kilometres above. Yet the deep trench communities are not sparse. Trench sediments often contain higher concentrations of microbial biomass than surrounding abyssal plains, because organic matter accumulates in the trench geometry. Principle: every depth, every pressure, every chemical environment that provides sufficient physical stability supports life. The deepest point on Earth is not an exception to life. It is another expression of it. [71]

Atacama Desert Microbes: Life in the Driest Place on Earth

The Atacama Desert in Chile is the driest non-polar desert on Earth. Some weather stations have recorded no rainfall for decades. Surface soils in the hyperarid core were long regarded as essentially sterile - comparable to Mars in their aridity and UV radiation levels - and were used as test beds for life-detection instruments intended for planetary exploration. Subsequent investigation found rich microbial communities beneath the surface, in salt deposits, inside rocks, and activated by rare humidity events. The Atacama is not lifeless. It is a place where life has found extremely sparse but stable niches - demonstrating that even the driest surface environment on

Earth contains life when searched for carefully enough. Principle: the absence of detected life reflects the inadequacy of the search, not the absence of the capacity. [72]

Cloud Bacteria: Life Reproducing in the Atmosphere

Living, metabolically active bacteria have been found in cloud water samples collected at altitude from mountain stations. These are not dormant spores being transported - they are active organisms reproducing within cloud droplets, exposed to ultraviolet radiation, sub-zero temperatures, and the chemical environment of atmospheric water. Amato and colleagues documented active microbial communities in cloud water at the Puy de Dôme station in France in 2007, finding bacteria capable of degrading organic compounds and cycling nutrients within the cloud itself. Principle: the atmosphere is not a transport medium for life. It is, in specific conditions, a habitat. Life occupies the air as well as the earth and the water. The standard model of life's domain must expand. [73]

Nuclear Reactor Pools: Radiation-Resistant Life in Radioactive Water

The cooling pools of nuclear reactors - intensely radioactive environments that would be lethal to humans within seconds - contain viable microbial communities, including strains of Deinococcus radiodurans and related organisms. These bacteria not only survive the radiation but in some cases appear to metabolise radionuclides as energy sources. Principle: the most lethal physical environments humans have created contain life. The conditions that most definitively mark the boundary of the human survivable zone are inhabited. Life finds the margin and occupies it. [74]

Turritopsis dohrnii: The Immortal Jellyfish

Turritopsis dohrnii is a small marine jellyfish that, when subjected to physical damage, starvation, or ageing, can reverse its entire life cycle - transforming from its adult medusa form back into the juvenile polyp stage and beginning development again. This process, called transdifferentiation, involves mature specialised cells reverting to an undifferentiated state and then redifferentiating into different cell types as the organism rebuilds itself from an earlier stage. The organism does not die. It resets. In principle, this cycle can repeat indefinitely. Principle: death is not an obligatory endpoint for all life. Some matter, when faced with conditions that would end other organisms, chooses a different path - regression to an earlier form and re-expression from there. The drive toward perpetuation operates even in the face of what standard biology classifies as terminal deterioration. [75]

Axolotl: Regeneration of Limbs, Heart, and Brain

The axolotl can regenerate fully functional limbs, including bone, muscle, nerve, and skin, after amputation. It can also regenerate significant portions of its heart and sections of its brain, with restoration of full neurological function. The regeneration is not scar tissue. It is precise reconstruction of the original architecture, including correct nerve reconnection and tissue-type boundary placement. The regenerating stump forms a structure called a blastema - a mass of dedifferentiated cells that proliferates and then re-differentiates into the correct tissues in the correct positions. The body retains, somewhere in its matter, the complete blueprint for every

structure it has already built. Principle: the information required to rebuild an entire limb or organ is distributed throughout the organism's matter, not localised in any single structure - and the drive to restore completeness activates that distributed information when needed. [76]

Planarians: Memory Survives Decapitation and Head Regeneration

Planarian flatworms can be cut into pieces, each of which regenerates into a complete organism. The head, tail, and any intermediate section each produces a full worm. In 2013, Shomrat and Levin trained planarians to navigate a textured environment to find food. After decapitation and full head regeneration - a process that produces an entirely new brain - the regenerated worms, when briefly re-exposed to the training environment, relearned the task significantly faster than untrained controls. The memory of the training had survived total removal and regrowth of the brain. Whatever stored that information was not the brain. It was distributed throughout the body - in the cells, the matter, the tissue architecture that persists below the head. Principle: memory and learned information are not exclusively properties of neural tissue. They can be stored in the body's matter and retrieved even after the organ conventionally associated with memory has been completely replaced. [77]

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Reference is made here only at a high level to the author's later work on the structure and scope of human emotional life. That work is under patent protection, so its specific terminology, formulae, internal architecture, and detailed results are not disclosed in this paper.

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