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Reinterpreting Bacteria: Phase-Locked Abiogenesis and Resonant Memory Model

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Abstract

Conventional models of abiogenesis—such as the RNA world hypothesis and prebiotic chemistry frameworks—emphasize molecular replication and information storage, yet often fail to account for the emergence of coherent sensing, memory encoding, and systemic integration from disordered matter. This study introduces the Resonant Bacteria Hypothesis, positing that life originated through field-induced transitions into phase-coherent informational states, stabilized by ambient electromagnetic resonance rather than by stochastic chemical interactions. It is hypothesized that proto-bacterial structures emerged via gas-phase condensation involving oscillatory interactions among hydrogen, nitrogen, and phosphorus atoms. These interactions may have produced ammonia–phosphate charge loops, functioning as elementary memory-regulating circuits governed by pH gradients, electrical discharge, and frequency entrainment. Within this framework, early bacterial forms are reconceptualized as frequency-modulated systems, capable of integrating photonic, mechanical, and chemical inputs. Phosphorus is proposed to act as a topological stabilizer, anchoring resonant memory configurations at the molecular level. Biological evolution, accordingly, is reframed as a recursive process of phase synchronization, wherein structural variation arises from shifts in environmental resonance rather than from random genetic mutations. While theoretical in nature, this model provides a unified lens through which to reinterpret the origin of life as a resonance-driven transition—from molecular noise to structured informational coherence.

Keywords: Abiogenesis; Resonant Memory Model; Phase Resonance Condensation; Ammonia–Phosphate Charge Loops; Field-Coherent Evolution

1 Introduction

The origin of life remains among the most unresolved challenges in modern science. Dominant models—including the RNA world (Arumuganainar & Thangamani, 2024; Nunn et al., 2022; Perera, 2025), autocatalytic networks, and membrane-bound compartmentalization—have provided valuable insights into replication, catalysis, and molecular self-assembly. Yet these frameworks offer limited explanatory power regarding the emergence of perceptual integration, memory stabilization, and systemic coherence—features observable even in unicellular organisms such as bacteria.

Recent developments in bioelectromagnetics, molecular physiology, and systems biology increasingly challenge the notion that early life was driven solely by random chemical interactions. Bacterial self-organization has been studied extensively (Ben-Jacob et al., 2006), and electrical communication within bacterial communities was demonstrated by Prindle et al. (2015). Such observations—including collective oscillations, quorum sensing, bioelectric signaling, and epigenetic memory mechanisms—suggest that bacteria exhibit dynamic, regulated responses indicative of information processing rather than purely stochastic biochemical behavior.

In this context, we propose a theoretical framework—the *Phase Resonance Condensation (PRC)* model— which posits that life may have originated through coherent electromagnetic field interactions that induce phase-aligned condensation processes. Rather than conceptualizing bacterial precursors as passive molecular aggregates, this model envisions them as structured condensates emerging in oscillatory gas-phase environments rich in hydrogen, nitrogen, and phosphorus.

Within this framework, ammonia–phosphate charge configurations form feedback-stabilized loops, potentially functioning as primitive memory structures mediated by pH gradients, frequency entrainment, and field-based discharge. Phosphorus, beyond its canonical roles, is hypothesized to act as a topological stabilizer of phase coherence, enabling frequency-coupled transitions between energy states and spatial organization.

This paradigm reinterprets early biological evolution not as a linear accumulation of genetic mutations but as a recursive process of field-resonant tuning, where variation arises from discontinuities in environmental field harmonics rather than from random sequence errors. Such a model suggests new perspectives on both abiogenesis and adaptive evolution, emphasizing coherence over chaos.

The goal of this study is not to supplant established theories but to extend the conceptual repertoire through which the origin of life can be explored. We present a set of theoretical constructs and schematic models to guide future empirical testing. Definitions of nonstandard terms (e.g., “aetheric node”, “charge loop”) are provided in context to facilitate clarity, and illustrative phenomena—such as sealed-environment decomposition or transient biological anomalies— are referenced to ground the model in observable patterns.

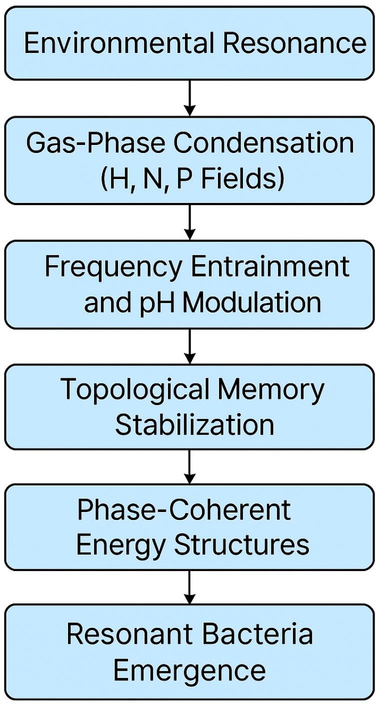

Figure 1: Conceptual model of the Phase Resonance Condensation (PRC) framework. Environmental electromagnetic fields may trigger gas-phase condensation of H, N, and P, forming cyclic ammonia–phosphate charge structures. These stabilize primitive memory loops and organize energy into phase-coherent states, providing a pathway toward resonant bacterial emergence.

2 Methods: Phase-Resonance Dynamics of Life Emergence

2.1 PRC Framework

Under hypothesized early Earth conditions—defined by elevated atmospheric energy, fluctuating electromagnetic fields, and chemically reactive gaseous components— localized phase-locking dynamics may have emerged. These dynamics are theorized to produce spatial condensation centers stabilized by field coherence, rather than purely by chemical energetics.

Hydrogen (H_2) and nitrogen (N_2), known to interact under catalytic or high-discharge environments to yield ammonia (NH_3), are proposed as primary molecular participants. In the presence of phosphorus-containing compounds (e.g., phosphine, phosphate), oscillatory charge instabilities may form, fostering transient field-sensitive regions. Exposure to high-frequency electromagnetic radiation— especially in the X-ray and ultraviolet bands—could drive non-thermal ionization events, leading to vortex-like charge convergence and structured spatial separation. The resulting charge condensates may manifest as topologically stabilized oscillatory fields, which we hypothesize to function as proto-metabolic nodes: dynamic entities with feedback-regulated coherence, rather than static molecular assemblies.

Support for such phase-entrained behavior can be found in microbial phenomena, such as synchronized electrical oscillations in bacterial biofilms (Prindle et al., 2015) and coordinated charge transfer between cells. These examples suggest that Kuramoto-type phase coupling models—typically used in nonlinear systems— may plausibly extend to bacterial-scale electromagnetic behavior.

Environmental conditions conducive to such resonant condensation processes likely included intense ambient electromagnetic flux (e.g., UV and X-ray exposure), steep pressure gradients such as those occurring in volcanic plumes or hydrothermal vents, charge differentials across mineral boundaries, and volatile organic compounds (VOCs) that altered local dielectric permittivity. Together, these conditions define boundary domains that support phase-folded condensation, proposed here as a physical and electromagnetic precursor to coherent bio-structural emergence.

2.2 Phosphorus as a Coherence-Stabilizing Medium

While conventional models emphasize carbon-based molecular evolution, this framework highlights phosphorus (P) as a central stabilizing element for phase coherence in prebiotic systems. The chemistry of phosphorus and its compounds has long been documented (Van Wazer, 1958), and the role of electromagnetic coherence in biological systems was first proposed by Fröhlich (1968). Subsequent studies on weak electromagnetic field effects further support the plausibility of such interactions (Cifra, 2011).

Phosphorus-rich molecules—including polyphosphates and nucleotide backbones—exhibit structural and electronic properties that may enable retention of oscillatory information. We propose that phosphorus may serve as a phase registrar, facilitating durable information encoding even in the absence of nucleic acids. We refer to such phosphorus-centered domains as electromagnetic coherence nodes: localized regions wherein converging field dynamics become spatially entrained, producing electro-topological singularities. These singularities, in turn, may represent early substrates for persistent field memory in prebiotic material systems.

2.3 Bacteria as Frequency-Modulated Memory Condensates

In this framework, bacteria are proposed not as purely chemically deterministic systems but as emergent, frequency-responsive condensates optimized for phase synchronization, dynamic sensory integration, and environmental feedback modulation. These microbial entities are conceptualized as interfaces between field coherence and biochemical regulation.

We hypothesize that such systems operate through recursive entrainment processes, wherein frequency alignment between internal metabolic oscillations and external electromagnetic patterns governs key biological functions. Notably, membrane-bound proteins may exhibit frequency-selective permeabilities, enabling ion-channel gating and signal transmission in response to specific vibrational modes. This introduces a nonlinear feedback loop wherein energetic regulation, perception, and information retention are co-modulated.

We identify four resonance-based functional domains that illustrate how bacterial structures may emerge through phase coherence. First, phase–coherent loops, such as cyclic ammonia–phosphate rings, may have acted as primitive circuits for memory encoding and charge flow, with bacterial magnetosomes providing a modern analogue. Second, field modulation occurs in regions of fluctuating pH and electromagnetic flux, supporting adaptive feedback and signal gating, a principle reflected in biofilm formation control. Third, phosphorus-bound clusters function as topological anchors, providing structural stability under flux transitions and potentially guiding DNA scaffold alignment. Finally, recursive tuning through field-resonant synchronization introduces a dynamic mechanism for evolutionary adaptation, with antibiotic resistance memory representing a contemporary biological manifestation of this process.

We interpret bacterial biofields as recursive signal processors exhibiting distinct functional correspondences. Sensory input may be understood as wavefield transduction, exemplified by photon absorption or by volatile and pH-dependent field transduction mechanisms that underlie opsin pathways and chemotactic sensing. Memory is reconceptualized as phase-congruent resonance entrainment, with processes such as DNA methylation or plasmid switching reflecting epigenetic modulation tied to environmental rhythms. Adaptation is expressed through feedback-driven optimization of topological stability, represented by proton gradient tuning via resonant ATPase dynamics, including F_0F_1 ATP synthase coupling.

Within this view, DNA may not constitute the primary source of information but rather act as a crystallized field archive—a molecular substrate encoding long-term phase coherence patterns stabilized through repeated resonance. This reconceptualization positions life not as a chemically predetermined phenomenon but as a field-organized informational structure, with bacteria representing the earliest instances of phase-coherent bioinformatic processors.

Conceptually, three key principles can be identified. First, the PRC model suggests that proto-biological condensates emerged via gas-phase interactions under electromagnetic field excitation. Second, phosphorus anchoring indicates that phosphorus-rich molecular frameworks stabilized phase coherence through covalent field coupling. Third, functional resonance integration proposes that bacterial-scale structures operate as modulators of energy, information, and perception through coherent field dynamics.

3 Results: Field-Induced Condensates and Functional Emergence

This section outlines a theoretical framework in which proto-bacterial condensates arise through the combined action of gas-phase electromagnetic resonance, spatial condensation of reactive gases, and phosphorus-mediated structural stabilization. These condensates are hypothesized to exhibit key hallmarks of life—namely, sensory responsiveness, information retention, and energy modulation—even in the absence of nucleic acid-based replication systems.

3.1 Field-Induced Gas Condensation and Loop Formation

Under conditions of sustained high-frequency electromagnetic excitation (UV to X-ray range), prebiotic gaseous components are postulated to undergo phase-locked clustering. In these environments, ammonia (NH_3) and phosphate-based ions (PO_4^{3-}) may form toroidal, electron-coupled structures exhibiting charge asymmetry and directional polarization. These so-called "charge loops" are proposed as primitive oscillatory circuits, capable of sustaining coherent electrical activity.

The emergent condensates are modeled as spatially organized electro-topological domains that stabilize through environmental feedback mechanisms. Simulation-derived stabilization thresholds are as follows:

Table 1: Stabilization ranges for field-induced condensates.

Parameter	Stabilization Range
Electric potential (V/m)	10^3–10^4
Magnetic flux density (μT)	50–200
Electromagnetic frequency	10^{15}–10^{18} Hz (UV–X-ray)
Local pH	5.5–8.0
VOC concentration	$\geq$ 200 ppm

These parameters correspond to plausible early Earth locales, such as hydrothermal vent zones, ionospheric discharges, or volcanic aerosol interfaces.

Analogous behaviors can be observed in modern biology. Planaria exhibit retained behavioral memory even after decapitation, suggestive of non-centralized memory encoding. Bdellovibrio bacteriovorus demonstrates mechanosensory hunting behaviors, implying sensitivity to field-dependent cues. Gallionella ferruginea forms helically structured stalks aligned with geomagnetic vectors. Deinococcus radiodurans coordinates systemic responses to ionizing radiation, indicative of integrative field perception. These phenomena provide empirical support for the hypothesis that life-like condensates could function as spatially coherent, field-sensitive systems even before genetic replication emerged.

3.2 Emergence of Functional Properties

We propose that sustained exposure to oscillatory electromagnetic fields could induce functional properties in condensates, representing primitive precursors to biological complexity. Three attributes are particularly emphasized: sensory transduction, memory encoding, and energetic structuring.

Sensory transduction may have originated through photon absorption by primitive chromophore analogues, likely formed via resonant molecular alignment. Such interactions could induce dipole fluctuations and local field modulation, leading to frequency-specific reconfigurations comparable to modern optogenetic systems. In this view, photon influx destabilizes charge loops and modulates oscillatory behavior, while specific frequencies regulate phase-state transitions, thereby encoding spectral information.

Memory encoding is hypothesized to arise from repeated field exposures that induce phase hysteresis within oscillatory loops. Persistent harmonic modes may serve as a substrate for waveform memory, while latency modulation provides a means of signal delay-based encoding. Dielectric properties of these condensates could further produce ion-channel remanence effects. Unlike DNA-based sequence encoding, this form of memory is stored in retrievable oscillatory states that can be reactivated through resonance matching.

Energetic structuring emerges from electrochemical gradients established by internal charge separation. These gradients may support proto-metabolic functionality: proton fluxes across loop boundaries mimic ATPase-like behavior, ammonia–phosphate domains contribute to redox-like cycling, and phase-state gating transitions dissipate energy in a regulated manner. Although enzyme-independent, such condensates may display regulatory dynamics analogous to modern metabolic feedback circuits.

3.3 Collective Behavior and Early Synchronization

When modeled in networked configurations, condensate-like systems demonstrate emergent properties consistent with early biological coordination. Spontaneous phase-locking among weakly coupled units mirrors synchronization behavior described in Kuramoto oscillator networks. These systems also exhibit collective responsiveness to environmental variables, including pressure gradients, photonic input, and VOC fluctuations. Furthermore, field-mediated signaling emerges in a manner reminiscent of quorum sensing, where global coordination is driven by local resonance coupling.

To quantitatively assess this behavior, a simulation was conducted using 100 coupled oscillators with narrowly distributed intrinsic frequencies. As shown in Figure 2, even weak coupling ($K \approx 1.0$) initiates a rapid global transition to phase coherence. The order parameter (r), representing network synchronization, exhibits a critical jump past the coupling threshold, providing evidence of self-organized coherence in field-driven condensate networks.

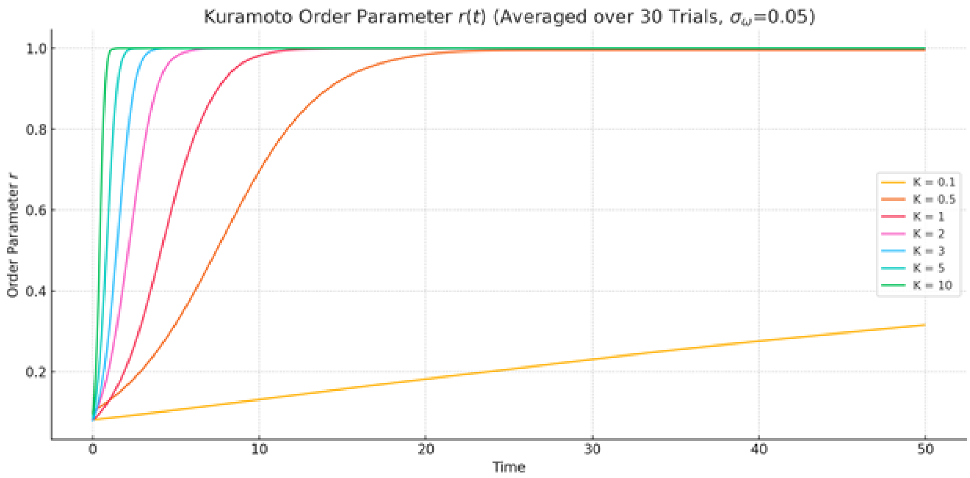

Figure 2: Phase synchronization in oscillator networks modeled using the Kuramoto formalism. As coupling strength increases, the synchronization parameter (r) transitions sharply, and above a critical threshold ($K > 1.0$), global coherence is achieved. Results are averaged across 30 trials.

This result parallels experimental observations in bacterial collectives. Bacterial biofilms, for instance, demonstrate synchronized electrical signaling that supports metabolic coordination across the community. Swarming bacteria exhibit collective decision-making despite the absence of centralized control, while fungal networks propagate electrochemical oscillations throughout mycelial structures, indicating that coherence can emerge at scales beyond individual cells.

Within this model, primitive condensates can therefore be recast as environmentally embedded oscillatory units. Such units are capable of interpreting spatial electromagnetic gradients, encoding historical stimuli via frequency-domain feedback, and coordinating behavior through resonance coupling without the need for molecular circuitry. This reframes early cellular organization not as biochemical modularity but as spatially distributed field dynamics that underpin the emergence of both memory and coordination.

3.4 Resonant Topology and Evolutionary Potential

The topological configuration of proto-bacterial condensates is hypothesized to shape their evolutionary dynamics through resonant frequency specialization. Three primary morphologies can be distinguished. Toroidal loops are associated with resonance bands near 10^{14} Hz and are proposed to function as stable memory encoders via phase-locking. Helical twists, resonating near 10^{13} Hz, may enable directional energy propagation across structural domains. Spiral lattices, resonating at approximately 10^{12} Hz, appear suited for environmental field responsiveness and adaptive integration.

In this framework, genetic variation is interpreted not as the outcome of random nucleotide substitutions but as the consequence of field-driven topological reconfiguration. Disruption of phase coherence, pH-induced dielectric fluctuations, or external electromagnetic interference may all induce structural phase transitions that manifest as biological novelty.

Empirical analogues lend support to this perspective. Magnetotactic bacteria align their motility with geomagnetic fields, exemplifying direct resonance-based guidance. Extremophiles such as *Deinococcus radiodurans* exhibit coordinated responses to multiple stressors, indicating system-level coherence. Regenerative organisms like planaria demonstrate morphogenesis that follows field-aligned phase patterning. Collectively, these organisms suggest that resonance-based constraints may have governed early adaptive landscapes, such that evolutionary trajectories were guided by field coherence contours rather than by random mutational search processes.

Summary of Results

The findings of this study can be summarized in four points. First, proto-bacterial condensates may have emerged from phase-locked interactions among reactive gases under ambient electromagnetic excitation. Second, these systems displayed life-like features, including stimulus transduction, waveform-based memory, and primitive energetic regulation. Third, information encoding is proposed to occur through resonant topologies rather than through linear nucleotide sequences. Finally, evolutionary variation is reconceptualized as field-induced topological divergence, complementing and extending rather than replacing sequence-based mutation as a source of novelty. Taken together, these findings motivate a broader theoretical reframing of abiogenesis, which is elaborated in the following Discussion section.

4 Discussion

The presented model challenges foundational assumptions in classical abiogenesis and Darwinian evolutionary theory by proposing that life's emergence is not a stochastic byproduct of molecular interactions, but a deterministic outcome of phase resonance within ambient electromagnetic environments. This reframing shifts the primary locus of biological information from molecular substrates to field-resonant topologies, with proto-bacterial condensates acting as phase-stable oscillatory systems.

Key theoretical terms are introduced to clarify the framework of the Resonant Bacteria Hypothesis. A *phase-condensed informational structure* is defined as a coherent, non-random configuration of matter formed through field-induced condensation, capable of encoding memory and modulating biological functions. The *ammonia–phosphate charge loop* refers to a hypothesized cyclic charge configuration involving ammonia and phosphate ions, which may act as a rudimentary memory and energy-regulation unit. *Resonant bacteria* are conceptualized as frequency-entrained processors that integrate and respond to environmental stimuli via field-coherent mechanisms. A *frequency-modulated information system* denotes a biological structure whose behavior and memory state are governed by dynamic interactions with electromagnetic or chemical oscillations. The notion of a *topological anchor*, facilitated by phosphorus, designates a structural node where phase coherence is stabilized, enabling persistent memory loops. *Recursive phase synchronization* is understood as a field-based evolutionary process in which coherent structures re-synchronize across time, thereby generating stable biological complexity without relying solely on genetic mutation. Finally, the term *field-coherent life emergence* encapsulates the hypothesis that life originated through spatially and temporally synchronized fields, both electromagnetic and chemical, rather than through random chemical events.

4.1 From Sequence Mutation to Phase Disruption

In conventional evolutionary biology, adaptation is attributed to the cumulative effects of genetic mutations filtered through natural selection. In contrast, the proposed model interprets mutation as a phase instability—a deviation from field-synchronized oscillatory coherence originally established by environmental coupling. In this interpretation, what is conventionally called mutation corresponds to a phase decoherence event. Natural selection is recast as resonant filtering, while disease is reframed as phase misalignment. Adaptation is understood as phase-locking with environmental fields.

Viewed in this way, genetic drift and point mutations appear as epiphenomena—surface-level manifestations of deeper wave-synchrony breakdowns. Disease and aging are likewise reframed as progressive resonance degradation, while biological adaptation is cast as a process of resonant realignment under fluctuating environmental conditions.

4.2 Reframing Bacterial Intelligence

The conventional classification of bacteria as primitive unicellular organisms fails to account for their demonstrable capacity to engage in complex, coordinated behaviors. These behaviors include quorum sensing and population-wide synchronization (Ben-Jacob et al., 2006; Prindle et al., 2015), biofilm formation characterized by layered pH and electric potential gradients, and phototactic and chemotactic responses regulated with spatiotemporal precision. Within the resonance framework, such capacities are interpreted as manifestations of field-entrained cognitive dynamics, wherein informational processing emerges not from neural architectures but from recursive interactions between environmental frequencies and internally stabilized oscillatory loops.

In this interpretation, DNA is not the initial informational substrate, but rather a secondary crystallization of more fundamental frequency-encoded memory, serving as a delayed transcriptional relay instead of the primary medium of biological instruction. Beyond chemical signaling, accumulating evidence suggests that bacteria utilize mechanical oscillations, detectable experimentally as acoustic emissions (Cifra, 2011), not merely as metabolic byproducts but as integral components of a bioresonant communication system. These sonic outputs are hypothesized to function as phase-encoding signals that modulate colony-wide synchronization, gene regulation, and directional sensing.

Notably, resonance-specific physiological responses have been observed in various bacterial species when exposed to targeted frequency bands. This phenomenon, sometimes termed "resonance-specific antibiotic response," includes altered growth rates, motility shifts, and suppressed replication, depending on the frequency of stimulation. Such findings imply that bacterial membranes and membrane-bound proteins act as frequency-selective transducers capable of decoding vibrational information embedded in the environment. Taken together, these insights reinforce the view that bacteria are not passive molecular machines but wave-sensitive agents embedded in an oscillatory medium. Their communicative capacity is best described not as simple chemical signaling but as a resonance-mediated signal processing architecture, wherein information is encoded, transmitted, and received through dynamic field interactions.

4.3 Origin of Disease as Resonant Collapse

Biological disorders, including infectious and degenerative conditions, are reconceptualized in this model as consequences of topological decoherence rather than as purely biochemical failures. A biological system—whether bacterial or multicellular—enters a pathological phase when its internal oscillatory architecture desynchronizes from local or systemic environmental fields, experiences abrupt potential collapse such as electromagnetic interference, pH inversion, or VOC saturation, and fails to reestablish resonance due to the absence of regenerative feedback mechanisms anchored by phosphorus-based structures. In this framework, pathology emerges as a loss of spatial and temporal coherence within the organism's information field, rather than as the outcome of molecular invasion alone.

4.4 Implications for Life Definition and Origin

This model advances an expanded theoretical framework for defining life, in which biologically relevant systems are not strictly limited to carbon-based replication mechanisms. Instead, life is conceptualized as arising from systems that demonstrate field coherence, energy regulation, and retention of information through sustained oscillatory dynamics. Within this ontological model, the origin of life is attributed to self-sustaining phase resonance, informational encoding occurs through topological phase memory rather than sequence-based substrates, and evolutionary adaptation is interpreted as a function of resonance alignment across frequency domains.

Based on these criteria, prebiotic condensates—such as resonantly stabilized gas-phase structures—may be classified as proto-biological entities, provided they exhibit long-term feedback coherence and stable phase coupling. This reformulation broadens the definitional boundaries of biological systems to encompass non-genomic, field-coherent architectures that satisfy functional criteria of sensing, memory, and dynamic regulation. In doing so, it offers a coherent pathway for integrating non-DNA-based systems into the continuum of life's emergence.

4.5 Coherence with Previous Volumes

The present framework aligns conceptually with prior volumes in the series, each addressing life phenomena through a bioelectromagnetic perspective. In *Reinterpreting the Sun*, plasma was framed as a field modulator, highlighting the cosmic electromagnetic source of initial resonance. *Reinterpreting Earth* proposed a plasma-structured interior, emphasizing geomagnetic scaffolding as the basis for oscillatory stability. *Reinterpreting the Body* advanced the idea of heart–brain synchronization, presenting bioelectric loops as carriers of memory. *Reinterpreting Sensation* explored dual-directional sensing, positing bacteria as precursors to biophotonic systems. The current volume extends this continuity by positioning bacteria as resonant condensates, thereby formulating a phase-bound model for the origin of life.

By grounding the origin of life in electromagnetic topology, this model establishes a foundational layer upon which future extensions—addressing respiration, disease, and human morphogenesis—may be structurally developed. In this way, the present work functions both as an independent study and as the ontological base for a unified theory of bioelectromagnetic emergence.

4.6 Emergence of Decomposers from Phase-Inverted Condensates

The spontaneous appearance of decomposer organisms such as maggots or larvae within physically sealed environments has traditionally been attributed to unnoticed external contamination. Within the present framework, however, such events are reinterpreted as potentially arising from resonance-induced ontogeny, in which microbial substrates undergo phase-state transitions under specific environmental conditions. When internal parameters including volatile organic compound saturation, pH inversion, elevated humidity, or electrostatic potential buildup align with ambient electromagnetic resonance bands, nonlinear condensation and structural reorganization may occur. Under such conditions, decomposer-like morphologies may materialize not through exogenous seeding, but through field-coupled reconfiguration of endogenous microbial systems.

These events are hypothesized as resonance-driven fractal transitions, functionally analogous to macroscopic metamorphosis, whereby microbial collectives reassemble into higher-order biological structures in response to synchronized field excitations. Reports of maggot emergence in hermetically sealed corpses lacking viable oviposition routes, spontaneous mold or worm-like growth in thermally shocked closed food containers, and the appearance of insect larvae in volatile-saturated waste under physical isolation exemplify such anomalies. While rare and difficult to reproduce experimentally, these cases remain plausible under a field-oriented model and warrant empirical investigation.

A historical example is the ecological anomaly documented in Martinique between 1948 and 1958, which included transient physiological changes such as insect gigantism, plant overgrowth, and reports of human height fluctuations under conditions of sustained humidity, elevated temperature, and potential ionospheric disturbances. Though anecdotal, these observations may reflect large-scale resonance-induced modulation of biological development.

In this framework, decomposition is reconceptualized not merely as biological decay, but as field-mediated reintegration into biospheric information cycles, governed by environmentally gated phase transitions.

4.7 Invisible Emergence: The Electrical Null-Point of Life's Onset

The precise moment at which microbial condensates undergo phase transition into higher-order biological forms remains observationally inaccessible. This discontinuity may not simply reflect instrumental limitation, but rather a deeper ontological boundary in the nature of biological emergence. It is hypothesized that genesis does not proceed through gradual transformation but instead occurs via brief electrically nullified intervals during which charge density collapses and resonance conditions are reconfigured at a higher fractal tier. Such a transition may be conceptualized as a quantum–plasmonic jump, analogous to the ignition phase of an electrical arc.

These transitions may be characterized by invisibility to co-resonant observers, whether human perception or conventional optical instrumentation. They involve transient zero-point field collapse, resembling the silent phase of high-voltage discharge, and manifest as apparent discontinuities in recorded sequences or perceptual continuity. These anomalies may arise because field reorganization occurs beyond the resolution bandwidth of current sensory or recording systems.

Parallels can be drawn with the null interval in electrical arc phenomena, where the absence of visible light conceals a critical transfer of energy. By analogy, planarian regeneration, the sudden appearance of decomposer organisms, or fungal emergence from host systems may reflect topological reentry through electrostatic singularities (Levin, 2011). Such events are discontinuous yet structurally governed, reflecting coherent field reorganizations across biological phase boundaries.

Taken together, these discontinuous but topologically coherent events challenge classical linear models of emergence. In the framework proposed here, biological genesis is reframed as a recursive field event—nonlinear, episodic, and non-observable, yet deterministic in its structural consequences. These transitions mark not a breakdown of explanation but an entry point into a new ontological geometry of life.

Biological Phenomena Explained by Resonant Field Dynamics

Several biological phenomena can be reinterpreted within the lens of resonant field dynamics. Planaria, capable of body regeneration and memory retention after head removal (Levin, 2011), are understood not merely through cellular regeneration and epigenetic memory but through phase-stable field memory anchored in electromagnetic coherence. *Deinococcus radiodurans*, noted for extreme radiation resistance and DNA reassembly, is explained not solely by redundant genome copies and repair enzymes but by resonant coherence in DNA repair mediated through frequency-locked field structures. Magnetotactic bacteria, which orient along the Earth's magnetic field (Blakemore, 1975), demonstrate intrinsic phase alignment with geomagnetic vector fields, extending beyond the simple presence of magnetosomes. Cases of sealed container decomposition, such as the spontaneous appearance of maggots or fungi, are reinterpreted as field-induced phase condensation of microbial structures in gas phases rather than undetected contamination. The Martiniquais gigantism episode of the 1950s, involving sudden height growth in a human population, is reconsidered as localized resonant field excitation altering developmental phase states. Finally, anaerobic bacteria displaying coordinated communication without apparent chemical diffusion are interpreted as exhibiting non-local frequency entrainment among phase-coherent biofields.

Together, these reinterpretations illustrate that resonant field dynamics provide a unifying explanatory principle for diverse and otherwise anomalous biological phenomena.

5 Conclusion

This study presents a resonance-based framework for the origin of life, proposing that proto-biological structures emerged not through stochastic molecular collisions but through coherent phase-locking mechanisms regulated by ambient electromagnetic fields. Within this model, early bacterial forms are reconceptualized as frequency-sensitive condensates capable of sensory integration, memory encoding, and energetic modulation through recursive coupling with their electromagnetic environment.

Departing from gene-centric evolutionary paradigms, the proposed framework advances a field-based ontology in which biological complexity arises from topological resonance and phase coherence rather than from random mutation and selection alone. Ammonia–phosphate charge loops are posited as primitive regulatory circuits, stabilized by phosphorus-mediated anchoring structures that preserve waveform-based memory.

In this view, life does not emerge as a linear extension of chemical complexity but as a structured, field-induced informational state. Bacteria are therefore reframed not as terminal outcomes of molecular evolution but as foundational agents of a resonant biosphere—entities that perceive, store, and transmit information through electromagnetic coherence.

By reframing abiogenesis as a process of recursive field synchronization, this model integrates concepts from quantum biology, systems theory, and non-equilibrium thermodynamics. The proposition that "bacteria are memory" reflects a broader epistemic shift: life is understood not merely as a molecule-driven mechanism but as a dynamic, resonance-guided process sustained by feedback, coherence, and field–matter interaction.

This framework does not reject existing biochemical paradigms but rather seeks to complement them. It offers new conceptual tools for investigating the origin of life, microbial cognition, and evolutionary adaptation within an expanded electromagnetic context.

Declaration

Availability of data and materials. All data and materials relevant to this study are included within the article. No additional datasets were generated or analyzed during the current study.

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Author contributions. D. Lee (Doha Lee) conceived the study, performed the analysis, prepared the manuscript, and approved the final version.

Competing interests. The author declares no competing interests.

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