

A Biophysical Hypothesis of “Oneness”

Abstract

Throughout history, philosophers and mystics have argued that all people are deeply interconnected, usually attributing this to supernatural or spiritual forces. This paper proposes a speculative biophysical hypothesis linking longstanding human concepts of “Oneness” and certain anomalous or spiritual experiences to the Earth–ionosphere electromagnetic environment. The model, termed the Global Neurological Emanation Repository (GNER), asks whether biological electromagnetic and photonic emissions could interact with persistent terrestrial resonant modes in ways that permit limited pattern persistence or coupling. Recent observations of Earth’s ambipolar electric field, biological ultraweak photon emission, transient gamma-frequency neural activity near death, and state-dependent thalamic oscillations provide empirical findings that motivate specific components of the hypothesis, but none directly demonstrates GNER. The paper develops candidate mechanisms involving environmental coupling, biological signal persistence, individual neural sensitivity, and thalamocortical integration, and identifies experimental and historical tests that could constrain or falsify them. The broader philosophical implication is conditional: if a measurable environmental component to some anomalous experiences were established, concepts such as connectedness and Oneness could be reconsidered as having a possible physical dimension without requiring that all spiritual experiences share a single cause. The critical test is therefore not whether selected historical episodes can be made to fit the proposed cycle, but whether the predicted relationship survives prospective analysis using predefined datasets, event thresholds, time lags, and statistical criteria.

Keywords: Perception; biophysics; spiritual phenomena; Schumann resonance; neurological; emergence; gamma waves; thalamus; thalamic oscillation; electromagnetic field theory; harmonic resonance; bioelectromagnetism; anomalous perception.

1. Introduction: The Problem of “Oneness”

"Out of many, one."

It is enshrined in the United States motto—*e pluribus unum*—but the concept of all peoples being deeply intertwined spans virtually all cultures across the planet. For millennia, mystics, philosophers, and religious thinkers have advanced the idea of a unified collective of thought, or "Oneness." We see this recurring theme in Eastern philosophies like Buddhism, which speaks of interdependent origination, and in the Stoic philosophy of thinkers like Marcus Aurelius, who described a single "Logos" or divine reason governing the cosmos. It also sits at the heart of the message attributed to Jesus, who stated "I and the Father are one" (John 10:30) and prayed for his followers "that they may be one, just as We are one" (John 17:22). This paper proposes that some experiences historically described through the language of Oneness may have a previously unrecognized biophysical component. The proposal does not assume that the religious interpretations of those experiences were literally correct, nor that all spiritual experiences arose from the same cause. It asks instead whether recurring human experiences of presence, connection, transcendence, and unity may have included a physically measurable component that earlier cultures could experience but could not physically identify. Recent

discoveries provide several measurable phenomena from which such a possibility can be explored, although they do not establish the proposed connection.

Historically, the variability of interpretation of experiences deemed spiritual creates the paradox highlighted by the "Blind Men and the Elephant" parable, where conflicting beliefs arise from perceiving only isolated parts of a larger whole. This paper explores the possibility that the "elephant" is a real, measurable biophysical system. While the proposed repository, if it exists, would provide an environmental context in which biological signals might interact, the specific mechanism by which such patterns could become integrated into subjective experience remains unknown and is one of the central questions of the hypothesis. The blind men represent everyone who has ever perceived a fraction of it—from witnessing a localized ghost to experiencing the diffuse, overwhelming feeling of global Oneness itself. Philosophically, this model acts as a bridge between empirical physics and mystical traditions. Rather than attempting to resolve the philosophical problem of consciousness, this paper asks whether some experiences historically described in spiritual terms might have measurable environmental correlates. It therefore asks whether some transcendent experiences could involve the biological interaction with environmental energetic fields.

GNER does not propose that consciousness is generated by a cardiac, cerebral, or planetary electromagnetic field. Nor does it require a quantum-coherence mechanism. Rather, it asks a different question: whether biological electromagnetic and photonic activity produced by living systems could interact with, and potentially leave persistent signatures within, the Earth's electromagnetic environment. In this respect, GNER is less a theory of the origin of consciousness than a hypothesis about a possible physical medium for biological signal persistence, environmental coupling, and anomalous perception. Existing work on cardiac–environment interactions, geomagnetic correlations, and electromagnetic approaches to consciousness provides relevant points of comparison, but does not establish the planetary repository mechanism proposed here.

GNER should also be distinguished from electromagnetic theories that propose the brain's electromagnetic field as the substrate or generator of consciousness. Such theories have faced substantial skepticism within neuroscience, including arguments that electromagnetic activity is better understood as a correlate or consequence of neural processing than as a causal substrate of consciousness. GNER makes no such claim. GNER is agnostic regarding the hard problem of consciousness; it addresses the possible physical basis of perceived interconnectedness and anomalous experience, not an explanation of why physical processes give rise to subjective experience. Neural activity remains the source of the biological signals considered here; the proposed role of the environmental electromagnetic field is instead that of a potential carrier, coupling medium, or repository. Whether such environmental coupling occurs is an empirical question independent of whether electromagnetic fields constitute the substrate of consciousness itself. The existence of other electromagnetic, cardiac, geomagnetic, or quantum-biological theories does not constitute evidence for GNER; their relevance here is comparative, identifying neighboring hypotheses and clarifying which empirical claims GNER shares with them and which predictions are distinctive.

2. Overview of the GNER Hypothesis

The central hypothesis, first considered informally by the author of this paper in about 1979, suggests that Earth is enveloped by an energetic field acting as a "Neurological Emanation Repository." This aggregate structure is built from the cumulative biological emanations of vast numbers of living organisms over evolutionary timescales. It is important to note that while the physical phenomena cited below—the ambipolar field, gamma surges, and biophotons—are empirically verified, linking them into the GNER model requires a significant leap in scale. We are using these proven phenomena to build a theoretical framework for exploration rather than claiming them as direct proof. At its core, the hypothesis breaks down into three components: The planetary Earth-ionospheric electromagnetic environment; material persistence/hysteresis in structures; neural sensitivity/thalamocortical coupling by biological receivers.

2.1 The Repository (The Field)

The hypothesis proposes that Earth's planetary electromagnetic environment could interact with biological energy in ways not yet characterized. This model proposes that the field could passively accumulate the filtered energetic fragments of life from the surface, slowly building a massive bio-energetic repository. This does not imply physical storage like a computer hard drive. The 'Repository' is not proposed as a literal database but as an emergent physical state arising from interactions among electromagnetic, atmospheric, and biological processes. The model hypothesizes that repeated biological inputs could produce structured energetic signatures rather than experiential memories, with their interaction potentially contributing to a larger, unified biophysical state. The model does not propose that the global field beams coherent messages back into human brains. Rather, it hypothesizes that weak interaction between the ambient electromagnetic environment and susceptible neural systems could contribute to some experiences of connection or Oneness. The mechanism of such interaction remains unknown.

2.2 The Synergistic Data (The Inputs)

Living systems emit biophotonic energy throughout life, while some studies of dying human brains have reported transient increases in organized gamma-frequency activity near death. Within the GNER hypothesis, these phenomena are treated as structured, potentially detectable physical patterns rather than as established memory-transfer mechanisms. One possibility explored here is that individual biological history could leave measurable physical signatures whose persistence or environmental coupling might be investigated experimentally. If such signatures existed and persisted, the physical trace of an individual life would no longer be confined entirely to the organism that produced it. That possibility is central to the paper's later discussion of memory, identity, connection, and survival after death.

2.3 The Interface (The Receiver)

If the proposed environmental field interacts with biological systems, all humans would potentially be exposed to it through their nervous systems, while a smaller number of people might exhibit greater sensitivity to particular environmental signals. These "sensitives" possess a slight variation in brainwave entrainment, allowing them to consciously or subconsciously sense

this ambient data. If such a trait exists, it could provide a physical basis for at least some historically reported anomalous or supernatural experiences.

The purpose of bringing these otherwise separate phenomena together is not to suggest that they already constitute a single mechanism, but to ask whether they might provide different pieces of a physical explanation for experiences that humanity has historically described in spiritual terms.

3. The Physical Repository

The 1979 theory of a neurological emanation repository or electrical field around the Earth was obviously speculative, as there was no direct measurement of the specific planetary-scale ambipolar electric field proposed here; the Earth's geomagnetic field and other atmospheric and ionospheric electrical phenomena were already well known. However, in August 2024, NASA confirmed the existence of this electrical field.

3.1 The Discovery and Nature of the Field

A NASA suborbital rocket mission (Endurance) successfully performed the first-ever measurement of Earth's ambipolar electric field (Collinson et al. 2024). Lead scientist Dr. Glyn Collinson described it as a fundamental energy field of our planet, just like gravity and the geomagnetic field. While its known function is atmospheric (it "puffs up" the ionosphere and drives the polar wind), its confirmation provides a tangible, planet-wide electrical structure. The Earth–ionosphere system already constitutes a naturally occurring electromagnetic resonant cavity, within which the Schumann resonances arise. The recently confirmed ambipolar electric field provides an additional large-scale electrodynamic component of the near-Earth environment. The GNER theory proposes that the interaction among the geomagnetic field, ionospheric electric fields, atmospheric conductivity, and the persistent Earth–ionosphere resonant modes may provide the physical environment in which biological electromagnetic information could, in principle, be retained or coupled. Coupling and persistence are separate requirements: a biological signal might perturb the environment without leaving a recoverable record of its source. The specific mechanism by which such information could enter, persist within, or be retrieved from this environment remains unknown and is a central question for experimental testing. Within the GNER model, this cavity would act as the physical foundation of the repository, capable of accumulating broad, pattern-like aggregates of nervous system activity arising from biological activity at the surface.

This idea of localized containment isn't without precedent in planetary mechanics. For instance, the Earth's ring current provides a useful, though highly imperfect, analogy: The magnetosphere can sustain organized energetic populations within a large-scale electromagnetic environment. The hypothesis asks whether analogous persistence of information-bearing electromagnetic patterns could occur within the Earth–ionosphere system. This remains a hypothesis rather than an established property of the cavity. The analogy therefore serves only to motivate investigation of whether the lower-energy Earth–ionosphere environment can support persistent electromagnetic patterns, including the possibility—proposed here—that some of those patterns could carry biological information. There is, however, extensive current research on the

Earth's ionosphere, including detailed measurement and modeling of its electron-density layers for navigation, communication, and space-weather application.

For the purposes of this hypothesis, the significance of this environment is not that it has been definitively shown to contain biological information, but that Earth possesses a persistent, planet-scale physical environment in which such a possibility can at least be formulated.

3.2 The Dynamo: Recharging the Resonance Cavity

Recent findings from NASA's ICON mission confirm how this resonance cavity remains energetically active (Immel et al. 2021). ICON provided the first direct measurements of the ionosphere's electrical generator, or "dynamo," revealing that high-altitude atmospheric winds physically drive the electric fields that dictate plasma motion. Operating much like a planetary alternator, these winds generate power through 'contactless magnetic friction'—a phenomenon recently proven by the University of Konstanz (Ganss et al. 2019). Rather than simply dissipating this kinetic energy, the dynamo transfers part of the wind-driven energy into the ionospheric electromagnetic system. Within the hypothesis, this continuously active electrodynamic environment could provide the energetic background in which the proposed repository operates. Following geomagnetic disturbances, ionospheric conditions can begin recovering toward pre-storm levels on timescales of approximately one to two days, although the rate and extent of recovery depend upon storm intensity, duration, and location. Nwankwo et al. (2016), for example, observed post-storm recovery tendencies in D-region conditions through VLF propagation measurements.

The GNER hypothesis proposes this relatively rapid physical recovery is significant: If the repository were established and it depends upon the configuration of the Earth-ionosphere electromagnetic environment, a major geomagnetic disturbance could temporarily disrupt that configuration even though the underlying ionospheric system subsequently re-establishes itself. Whether such disruption would merely modulate stored information or could erase or reorganize it remains an experimentally testable question.

3.3 The Environmental Oscillatory Background: The Schumann Resonance

This dynamically recharged resonance cavity is not silent; it exhibits measurable resonant frequencies. The space between the Earth's surface and the ionosphere acts approximately as a global electromagnetic resonant cavity, supporting a fundamental Schumann resonance near 7.8 Hz, with additional higher mode harmonics extending upward. Known to physics as the Schumann Resonance (Schumann 1952), this low-frequency electromagnetic "heartbeat" is generated by global electrical activity and trapped within the cavity. Within the GNER model, the Schumann resonance is provisionally treated as a possible environmental carrier or coupling condition. "Carrier" is used here as model terminology rather than as a claim that the Schumann resonance is known to transmit biological information. The Earth–ionosphere system is a driven, dissipative electromagnetic environment whose properties vary with atmospheric, ionospheric, geomagnetic, and solar conditions. Within the GNER hypothesis, these properties are proposed as the physical environment in which biological electromagnetic patterns might interact or persist. For GNER, the importance of this resonance is therefore not that it is assumed to contain

a message, but that it represents a persistent planetary rhythm within which biological signals, if sufficiently coupled, might interact with the environment.

3.4 Capacity Constraints and Periodic Reset

The resonance cavity described in Sections 3.1–3.3 is not a static archive. Like any physical system operating under thermodynamic constraints, it cannot accumulate signal indefinitely. Like any physical system subject to dissipation and noise, the proposed repository could not be assumed to preserve structured information indefinitely. The model therefore hypothesizes that sufficiently severe solar-particle or geomagnetic events could provide a recurring mechanism for disrupting or reorganizing accumulated signal patterns on a timescale provisionally estimated here at roughly 500 years. The interval between these events is consequently treated as a provisional historical/model parameter rather than as a derived physical capacity. A numerical estimate of electromagnetic carrying capacity cannot presently be justified because the physical encoding mechanism, signal strength, coupling efficiency, and decay characteristics of the proposed repository remain unknown.

The 1859 extreme solar event, first documented by British astronomer Richard Carrington, remains the most powerful geomagnetic storm in the instrumental record (Carrington 1859; Tsurutani et al. 2003). The event produced auroral displays at equatorial latitudes and induced massive electrical currents in telegraph infrastructure worldwide, making it one of the most extreme geomagnetic disturbances in the instrumental record. Within the GNER model, such an event is hypothesized as a possible mechanism for substantially disrupting or reorganizing accumulated signal patterns in the resonance environment.

The recurrence interval of extreme solar events can be estimated through proxy records preserved in tree rings and ice cores. Carbon-14 excursions — sharp spikes in atmospheric radiocarbon caused by intense solar particle bombardment — provide a datable record of past superstorms extending millennia before direct observation. Two such events have been precisely dated: a major excursion in AD 774–775 (Miyake et al. 2012) and a second in AD 993–994 (Miyake et al. 2013). Both events produced radiocarbon signatures substantially larger than those associated with the 1859 event, although the relationship between radiocarbon amplitude and geomagnetic-storm intensity is not one-to-one. A major solar-particle event reconstructed from tree-ring carbon-14 data in the seventh century BCE falls within the broad chronological span of the Axial Age — the extraordinary simultaneous emergence of foundational philosophical and spiritual traditions across Greece, Persia, India, and China between roughly 800 and 200 BCE. Although the temporal relationship is intriguing, it does not by itself imply causation; the implications of this possible alignment are explored in Section 6.4.

The periodic clearing of the resonance cavity should not be understood as a catastrophic loss of accumulated signal. Within the GNER framework, the model treats it as a possible renewal mechanism — analogous to a forest fire that clears accumulated biomass and enables new growth. The underlying Earth–ionosphere system, being driven by ongoing atmospheric and solar dynamics, persists through and recovers from geomagnetic superstorms although its electromagnetic configuration can change substantially during and after such events. Within the GNER model, the repository therefore need not cease to exist; instead, a major disturbance could

reduce or reorganize its accumulated signal density, but leaving it capable of accumulating the next cycle of neurological emanations.

This mechanism finds a structural parallel in the planet's own electromagnetic architecture. Critically, the ring current undergoes dramatic disruption during major geomagnetic storms, releasing its stored particle population in a cascade event. If the planet's primary magnetic containment structure undergoes periodic forced discharge during superstorms, it provides a structural analogy for investigating whether the lower-energy biometric signatures accumulated in the Earth-ionosphere resonance cavity undergo a comparable clearing process.

This model predicts that the period immediately following a major geomagnetic reset — as the ionospheric reconstitution window closes and the cavity begins reaccumulating signal — would be characterized by a relatively low level of the ambient biometric field available for sensitive perception. Conversely, the period immediately preceding a reset, when the cavity approaches maximum signal density, would be characterized by the highest intensity of ambient field available for interface. If the proposed repository accumulated biological information over long intervals, its hypothesized reset cycle would have an unusual consequence: the physical environment itself might influence the historical distribution of experiences interpreted as spiritual or transcendent. This is not assumed here; it is a prediction that makes the historical record potentially relevant to the model, and is examined in detail in Section 6.4.

With the potential architecture of the repository in hand, we turn to the contents: The biological signals produced by living systems.

4. Biological Signal Contributions and Phase-Locking

If the resonance cavity supported by the ambipolar field acts as the ‘repository’, the ‘data’ that fills it must come from life itself.

4.1 The Baseline: Biophotonic "Presence"

Biophysics has established that living cells and organisms can emit ultraweak photons (Popp et al. 1994; Kobayashi 2014). Biophotonic emission arises from cellular metabolic and oxidative processes and may vary with physiological and neural activity. This faint biological emission provides a continuous, low-level source of photons from living tissue. Within the GNER model, this continuous emission builds a baseline resonant presence over a lifetime. Because individual neural organization and physiological history vary substantially among people, the model hypothesizes that the temporal and spectral characteristics of lifelong biological emissions could contain individual-specific information, a "Biometric Resonance Signature"—a harmonic fingerprint of existence. The term “presence” is used deliberately here. Across religious and spiritual traditions, the sense that life leaves something of itself in the surrounding world is remarkably persistent. GNER asks whether that intuition might have a measurable physical analogue, even if the traditional interpretations of it are not scientifically literal.

4.2 The Imprint: Gamma Waves as Harmonic Anchors

A May 2023 study monitoring dying human brains reported a marked, organized surge of gamma-frequency neural activity in the moments after the heart stopped, specifically localized in the brain's neural hot zone (Borjigin et al. 2023). Gamma oscillations occupy one of the higher-frequency ranges of recognized neural activity, associated with higher-order functions, memory retrieval, and dreaming. Instead of the GNER accumulating the entirety of a person's lived experience—which would create a massive data storage bottleneck—this model proposes that the gamma burst acts as what this paper calls the Harmonic Anchor hypothesis. The philosophical distinction here is significant. GNER does not require that a person's memories be preserved as though a complete recording had been uploaded somewhere. It proposes only that aspects of biological organization might leave a physical signature. If that signature retained information about its source, the distinction between biological death and the persistence of information would become more subtle than a simple choice between “the person survives” and “nothing remains.” The GNER model therefore treats the terminal gamma event as a possible information-rich biological state rather than as an established memory-transfer mechanism. The temporal and spectral organization of terminal neural activity could, in principle, provide a final biological signature associated with the individual. Whether such activity contains information about stable individual characteristics, whether that information can couple to the external electromagnetic environment, and whether any resulting signal persists are all unresolved questions. It should be noted that while this terminal gamma event has been discussed in the broader context of end-of-life neural activity, it does not establish the content or subjective meaning of the terminal surge.

4.3 Interpersonal Entrainment and Mutual Phase-Locking

Neural activity is not isolated within individual brains. During social interaction, measurable synchronization can emerge between the brains of interacting individuals. Dumas et al. (2010), using simultaneous EEG recordings from interacting pairs, found that behavioral synchrony correlated with an inter-brain synchronizing network, particularly in the alpha-mu frequency range. Their findings demonstrate that neural activity can become dynamically coordinated across individuals during interaction, although the physiological mechanism responsible for the observed synchronization remains an active area of investigation.

Within the GNER hypothesis, this phenomenon raises a further possibility. If neural activity can become dynamically coordinated across individuals through mechanisms that may include environmental or electromagnetic coupling, then the possibility exists that repeated biological emissions could interact with and reinforce compatible patterns within a larger resonant electromagnetic environment. Such reinforcement could, in principle, contribute to the formation of persistent information-bearing patterns rather than requiring the repository to store each biological emission independently.

This proposed process is not equivalent to the inter-brain synchronization demonstrated by Dumas et al. Their experiment does not establish biophotonic transmission, gamma-wave exchange, or a planetary repository. Rather, it provides an experimentally observed example of biological neural systems becoming dynamically coupled across individuals. The GNER concept

extends this principle speculatively to a larger electromagnetic environment and predicts that, if such coupling exists, measurable patterns of persistence or clustering should eventually be detectable.

4.4 Quantum Entanglement and Signal Transfer

Quantum mechanics is fundamental to biological matter, and research in quantum biology has identified several biological systems in which non-trivial quantum effects may contribute to physiological function. Lambert et al. (2013), for example, reviewed evidence for functional quantum coherence in processes including photosynthetic light harvesting and avian magnetoreception. These findings demonstrate that quantum effects can operate within biological systems under physiological conditions.

Biophotons are produced through quantum processes at the molecular level, but this does not establish that biological photon emissions remain quantum-coherent or entangled after leaving the organism. Nor is there currently evidence that human neural activity generates entangled photon states capable of transmitting information over planetary distances. The hypothesis therefore does not require quantum entanglement as its primary transmission mechanism. A more conservative possibility is that biological electromagnetic and photonic emissions interact with the Earth–ionosphere environment through conventional electromagnetic coupling, resonance, interference, or other mechanisms not yet identified. Quantum effects could potentially contribute at the molecular or neural interface without requiring long-range quantum communication.

If future experiments demonstrate persistent quantum correlations in biologically generated photons under physiological conditions, the findings could provide an additional mechanism by which biological information might interact with larger electromagnetic systems. At present, however, this remains a tantalizing possibility rather than evidence for the existence of GNER.

5. Local Containment vs. Global Integration

The GNER, however, is not proposed as the only potential repository of emanations. Under this model, localized phenomena such as ghosts or ‘last recall imprints’ would not be direct downloads from the GNER. They are separate, contained events.

5.1 The Hysteresis Effect and Local Recordings (Explaining "Ghosts")

The GNER hypothesis also proposes a possible explanation for why some anomalous experiences appear to be associated with particular physical locations. These events would not represent direct downloads from the GNER, but rather localized environmental phenomena produced by the interaction of biological electromagnetic activity with surrounding materials.

An important distinction is necessary here. The gamma activity observed in the dying brain is a neural oscillation measured through EEG, not gamma radiation. Borjigin et al. (2023) observed marked increases in gamma-frequency neural activity in two of four dying patients,

including activity in the 25–55 Hz and 80–150 Hz ranges. The finding demonstrates an unusual state of synchronized neural activity near death, but it does not establish that the brain emits an externally propagating gamma burst. The theory therefore treats the observed gamma activity as a possible indicator of intense, structured physical patterns rather than encoded semantic content during an electromagnetic event such as ionizing radiation.

The further hypothesis is that, under some conditions, such biological electromagnetic activity might interact with nearby materials in ways that produce persistent or slowly decaying physical changes. Certain materials are capable of retaining information about previous electromagnetic or radiation exposure through mechanisms such as magnetic remanence, dielectric charge trapping, ferroelectric polarization, or radiation-induced changes in material defects (Jiles 1998). These mechanisms are well established in specific engineered materials, including magnetic and electronic memory systems, but there is presently no evidence that ordinary stone, masonry, or household metals can record a transient neural signature in the manner proposed here.

The possibility nevertheless merits investigation. Mineral composition, crystal structure, metallic inclusions, moisture content, geometry, and electromagnetic properties could determine whether a particular environment is more capable of coupling to and retaining weak biological electromagnetic signals. Under this interpretation, a localized anomalous perception would not be a supernatural entity and would not necessarily represent a complete recording of a deceased person. It would instead be a hypothetical localized physical persistence associated with an unusual biological event and the material environment in which it occurred.

Material hysteresis also provides a possible empirical question concerning the long-standing association between anomalous experiences and older structures such as castles, temples, catacombs, and historic residences. Rather than treating historical reports as proof of material recording, the hypothesis predicts that, if such reports correspond to a physical environmental phenomenon, their frequency should correlate with measurable characteristics of the locations in which they occur. Mineral composition, magnetic susceptibility, electrical conductivity, dielectric properties, architectural geometry, ambient electromagnetic fields, and other environmental variables could therefore be compared between locations associated with repeated reports and appropriate control locations.

A particularly strong test would be to determine whether a measurable, repeatable physical signal can be detected from a location immediately following a controlled biological electromagnetic stimulus such as a controlled EEG session or a defined electromagnetic pulse, and whether that signal persists after the stimulus has ceased. Failure to demonstrate such persistence would substantially weaken the local-recording component of the GNER field. A reproducible material response, by contrast, would establish a physical mechanism that could then be investigated independently of the broader GNER model.

5.2 Signal Dominance (The Human Element)

This hypothesis naturally raises questions about the contributions of non-human life. Living organisms emit biophotons, while organisms with nervous systems also generate

electromagnetic activity associated with neural function. Biological signals may also possess species-specific characteristics that affect their detectability by other organisms. Within the GNER hypothesis, this could create a form of signal selectivity: humans would be expected to interact most readily with biological patterns generated by other humans because the human nervous system is the proposed receiving system in this model. Biological signals from other species could differ in frequency distribution, temporal structure, amplitude, modulation, or other characteristics relevant to detection. Such differences could make some signals less detectable or less interpretable by human neural systems. This could provide one possible explanation for why localized recordings or perceived unified entities termed ‘angels/demons’ (a distinction explored further in Section 5.3) are almost universally perceived as humanoid or directly related to human experience, rather than the “ghost” of a deer or an eagle. Signals originating from other species might therefore remain below perceptual thresholds, fall outside the relevant neural response characteristics, or simply lack the information structure necessary for human interpretation. Since many reported intelligent apparitions or entities are described in human or human-like terms, this prevalence and cultural variation of such descriptions would itself require systematic study. If this species-selective interpretation is correct, comparable anomalous environmental signals might not be perceived identically by organisms possessing substantially different sensory and neural architectures.

The hypothesis does not require such signals to contain an objectively recognizable “human form.” Rather, a human observer encountering a biologically derived signal would interpret whatever information is accessible through the perceptual and cognitive machinery available to that observer. Cultural conditioning would then provide the interpretive framework. A person raised within a Christian tradition might interpret a perceived benevolent presence as an angel, while another observer might interpret a similar experience according to an entirely different cultural or religious vocabulary. In this interpretation, “angel” and “demon” describe the observer’s interpretation of a perceived signal rather than necessarily identifying distinct physical species or supernatural beings. The underlying signal could be the same while its perceived meaning varies with the receiver.

5.3 Integration, Isolation, and the Philosophy of Ethics

One of the more consequential philosophical possibilities raised by GNER concerns the ancient distinction between integration and isolation. Across religious traditions, Heaven, Paradise, Nirvana, and related concepts are associated in different ways with union, fulfillment, communion, or release from separation, while Hell and related concepts often involve estrangement, isolation, or loss. GNER asks whether this recurring contrast might have a physical analogue. Rather than treating these states as locations governed by supernatural judgment, the GNER hypothesis proposes that the fate of a persistent biological signature could depend upon its degree of compatibility with other signatures within the repository. If biological information is represented through complex patterns of frequency, phase, amplitude, temporal structure, and other characteristics, then interaction between signatures would not necessarily be random. No such mapping is presently established. Patterns possessing compatible characteristics could reinforce one another, while incompatible patterns could experience weaker coupling, interference, or progressive loss of coherence. If such compatibility existed, the philosophical implication would be significant. The traditional moral language of Heaven and

Hell could be understood not simply as obedience to an external authority, but as an ancient way of describing the consequences of connection and isolation. This does not imply that morality can be reduced to a single frequency or that “good” and “evil” have objectively measurable wavelengths. In this interpretation, empathy, cooperation, and attachment to others acquire a possible biophysical dimension: behaviors that strengthen human connection may also contribute to the patterns of interaction that this model proposes as fundamental to integration. Whether measurable behavioral or physiological indications of social bonding correspond to detectable differences in biological electromagnetic signatures is an open empirical question.

Within this framework, the concept of “harmony” acquires a physical rather than exclusively moral meaning. A signature that is highly compatible with a large population of other human signatures might become more strongly integrated into the collective repository. Conversely, a signature whose characteristics are persistently and radically incompatible with those of the surrounding human population might remain weakly coupled, fragmented, or isolated. This gives a possible biophysical interpretation of the traditional distinction between Heaven and Hell. Heaven would represent a state of high integration and persistent harmonic compatibility; Hell would represent a state of prolonged isolation or failure to integrate. The terminology is metaphorical, but the underlying distinction could in principle be expressed through measurable properties of signal interaction. The ethical implication is consequently different from the traditional idea of supernatural reward and punishment. If personality is partially represented in a persistent biological signature, then behavior that promotes empathy, cooperation, attachment, and social integration could also tend to produce signatures more compatible with those of other humans. The model would therefore require empirical investigation of whether measurable biological signatures correlate at all with stable personality or social-behavioral characteristics.

The proposed mechanism would necessarily involve a multidimensional pattern of biological information, and determining whether personality characteristics are actually represented in such patterns would be an important empirical problem. The resulting state would also differ fundamentally from ordinary human self-awareness. Without a functioning biological brain, the mechanisms underlying autobiographical memory, self-referential processing, and the ordinary sense of individual identity would presumably no longer operate in their present form. If any biological information persisted within the proposed repository, it would therefore have to exist in a different physical representation.

The subjective interpretation of such a state is necessarily speculative. One possibility is what might be called Ambient Awareness: not the continuation of the waking human ego, but a nonlocal persistence of information within a larger integrated system. Familiar individuals would not necessarily be encountered through ordinary recognition or episodic memory. Instead, their signatures might be experienced through harmonic compatibility—a physical analogue of familiarity, safety, attachment, or completeness. Under this interpretation, the ancient concepts of Heaven and Hell may preserve, in symbolic form, an intuition that human beings have long expressed in moral and spiritual language: connection is experienced as desirable, while profound isolation is experienced as suffering. The GNER hypothesis asks whether that distinction might ultimately have a physical counterpart.

6. Human Perception and Entrainment

If the coherent gamma wave and biophotonic summation represent the proposed biological inputs, humans would serve as the biological interface. All humans would potentially be exposed to the environmental field, but “sensitives” would represent a proposed statistical variation in neural responsiveness. They would not possess supernatural abilities; rather, they would be individuals who might exhibit unusually low thresholds for detecting or responding to weak environmental signals. They would represent the high-sensitivity end of a distribution of neural sensitivity, with some individuals potentially exhibiting greater awareness of weak environmental influences. The brain already has mechanisms for detecting, filtering, integrating, and responding to external signals, such as circadian entrainment to light cycles. This possibility provides a naturalistic way to reconsider an ancient role attributed to mystics, prophets, shamans, and other individuals regarded as unusually receptive to experiences outside ordinary awareness. GNER does not assume that such individuals possessed supernatural abilities. It asks whether some people may instead have been unusually responsive to weak environmental signals that most nervous systems normally filter out. The question posed by GNER is whether extremely weak environmental electromagnetic patterns could participate in those processes under particular physiological conditions. One historical model that may be relevant here is Julian Jaynes's concept of the 'bicameral mind,' which proposes that pre-conscious humans perceived internally generated neural signals as external voices or divine commands; this is developed further in Section 6.3.

6.1 The Tuning Mechanism: Brainwave Entrainment

If the Earth–ionosphere environment provides a persistent electromagnetic reference for the GNER system, the human interface would require some mechanism by which environmental signals could influence neural activity. The Schumann resonances provide one possible candidate for such a coupling environment because they occupy a frequency range that overlaps naturally occurring human brain oscillations. The fundamental Schumann resonance is approximately 7.8 Hz, at the boundary between the conventional theta and alpha frequency ranges. This coincidence does not demonstrate that the Schumann resonance controls self-awareness or that the brain is biologically dependent upon it. It does, however, provide a frequency range in which interactions between environmental electromagnetic oscillations and neural activity can be investigated.

Modern neuroscience demonstrates that neural oscillations can become entrained to rhythmic features of the external environment. Such entrainment can influence the timing and coordination of neural responses and can affect how information is selected and integrated (Thut et al. 2011; Thut et al. 2019). (2011 for timing/coordination; 2019 for information selection and integration). The thalamus is particularly relevant because it participates in the filtering and integration of sensory information and in the coordination of distributed cortical activity. Within the GNER hypothesis, therefore, the Schumann resonance need not be regarded as the information itself. It could instead function as a low-frequency environmental carrier, reference, or coupling condition through which more complex biological electromagnetic patterns might interact with the nervous system. Higher-frequency components of a biological signature—including gamma-range neural activity or other temporal patterns—could theoretically be

coupled to this broader environmental structure. The specific mechanism by which such cross-frequency interaction or modulation might occur remains unknown, but the neural phenomenon itself is documented.

This model also provides a possible physical basis for individual differences in anomalous perception. If people vary naturally in the sensitivity, filtering, or entrainment of neural networks to weak environmental signals, some individuals might detect patterns that remain below the perceptual threshold of others. Such individuals would not necessarily possess a fundamentally different sensory organ; they might instead occupy the high-sensitivity end of the normal distribution of neural sensitivity. This is the sense in which the GNER discussion uses the term “sensitive.” It refers to a proposed variation in neural responsiveness rather than to a supernatural ability. The critical experimental question is whether individuals who report unusually frequent sensed presences, apparitions, or related experiences demonstrate measurable differences in neural responses to controlled weak electromagnetic stimuli or naturally occurring environmental electromagnetic variation.

There is some experimental precedent for investigating this possibility. Persinger and colleagues reported that weak, complex magnetic fields applied across the head could produce unusual subjective experiences, including sensed presences, altered states, and changes in the sense of self (Persinger 2009; Persinger et al. 1994, 2000). However, these findings remain contested. In a double-blind study of 89 participants, Granqvist et al. (2005) found no evidence that the weak magnetic fields themselves produced sensed-presence or mystical experiences and reported that measures associated with suggestibility were better predictors of the reported experiences. Persinger and Koren subsequently disputed that interpretation and defended their experimental methodology. The literature therefore does not establish that weak magnetic fields reliably produce anomalous experiences, but it does demonstrate that the proposed relationship can be subjected to controlled experimental testing.

This distinction is important to the GNER concept. Persinger's work should not be treated as evidence that a planetary repository exists or that unusual experiences represent reception of stored biological information. Its relevance is narrower: it provides a precedent for testing whether weak electromagnetic conditions can influence the neural processes associated with sensed presence and altered states. If such effects can be independently replicated under rigorously controlled conditions, individual differences in susceptibility could then be investigated as a possible component of the proposed GNER receiver mechanism. Field observations provide another possible avenue of investigation. Novik et al. (2022) reported associations between space-weather conditions, VLF emissions of magnetospheric origin, and unusual human experiences including reported sensed presences and altered states. Such findings are potentially relevant because they raise the possibility that naturally occurring electromagnetic conditions can be examined alongside human perceptual and neurological responses. They do not, however, establish that the experiences arise from biological information stored in the Earth–ionosphere cavity.

The GNER hypothesis consequently makes a more specific prediction. If some individuals possess unusually high sensitivity to environmental electromagnetic patterns, those individuals should exhibit reproducible physiological or perceptual responses under controlled

exposure conditions. These responses should be distinguishable from expectation, suggestion, sensory deprivation, and other psychological variables. Ideally, experiments would compare self-identified sensitives with matched control participants while recording EEG or other measures of neural activity during sham and precisely characterized electromagnetic exposures. A positive result would not by itself demonstrate GNER. It would establish only that individual differences in human sensitivity to weak electromagnetic environments exist and could provide a biological interface through which the larger hypothesis might be investigated. A failure to demonstrate such differences would substantially weaken the proposed receiver mechanism.

6.2 The Thalamic Transducer and Harmonic Coupling

Having proposed the repository as the underlying data source and the possibility that harmonic synchronization contributes to state-dependent awareness, we can now consider a specific biophysical component that might participate in this process. The central thalamus is a plausible candidate for investigation as a transducer or integrative interface between environmental oscillations and distributed neural activity. This does not imply that the thalamus alone generates self-awareness (Kaufmann et al. 2026). Rather, its extensive connections with cortical and subcortical systems make it a potentially important component through which environmental signals could influence global brain state.

The previous sections proposed that the Earth–ionosphere environment provides a persistent electromagnetic background in which the GNER, if it exists, would operate. The question then becomes how such an environmental signal could interact with individual neural systems. The thalamus is particularly relevant because it participates in the transmission, filtering, and integration of information among sensory, motor, limbic, and cortical networks (Neske & Cardin 2025). Its nuclei are functionally diverse, and contemporary research increasingly supports an important role for thalamocortical interactions in regulating conscious states. Here the hypothesis proposes a possible chain of interaction: environmental electromagnetic conditions may influence neural oscillatory dynamics; thalamocortical networks may integrate those dynamics with information arising within the organism; and, under particular conditions, the resulting state may contribute to the subjective experience of coherence, presence, or connectedness. The present evidence does not establish that chain, but it provides a framework in which each link can be investigated independently.

Recent neuroscientific research provides new evidence relevant to this possibility. Fang et al. (2025), using simultaneous recordings from human thalamic nuclei and prefrontal cortex during a visual perception task, found that intralaminar and medial thalamic nuclei showed earlier and stronger activity associated with conscious perception than the ventral nuclei and prefrontal cortex. They also reported transient thalamofrontal synchrony and cross-frequency coupling associated with conscious perception. These findings do not establish a planetary electromagnetic influence, but they strengthen the case for investigating the thalamus as an active participant in the neural mechanisms underlying conscious perception. Further evidence comes from Staudigl et al. (2026), who identified a previously unreported oscillation in the human central thalamus in approximately the 19–45 Hz range. This oscillation was present during wakefulness and REM sleep but absent during non-REM sleep, and was particularly associated with the central thalamus. The finding is potentially relevant to the GNER potential

because the observed frequency range overlaps several integer multiples of the approximately 7.8 Hz Schumann fundamental.

The numerical relationship is straightforward. The third, fourth, and fifth harmonics of a 7.8 Hz fundamental occur at approximately 23.4, 31.2, and 39.0 Hz, respectively. These frequencies fall within the 19–45 Hz range reported in the central thalamus. The correspondence is therefore noteworthy, but it does not demonstrate harmonic coupling. The observed thalamic oscillation is a biological phenomenon and could arise entirely from intrinsic neural mechanisms. The hypothesis proposes that the correspondence should nevertheless be investigated experimentally as a possible interaction between environmental electromagnetic oscillations and thalamocortical dynamics. In this model, the thalamus functions less like a generator of self-awareness than like a routing hub within a larger distributed system. It integrates and regulates information flowing among multiple neural networks, while potentially providing a site at which weak external rhythmic influences could interact with endogenous oscillatory activity. The Schumann resonance would not itself constitute the information being experienced. Instead, it could provide a low-frequency environmental reference or coupling condition within which more complex biological signals might interact with the nervous system. Because the reported thalamic range is broad, the overlap alone has limited evidentiary weight; a stronger test would ask whether discrete thalamic spectral peaks systematically track Schumann harmonic frequencies across individuals or environmental conditions.

It is useful here to distinguish two levels of activity. One is the environmental baseline: the persistent electromagnetic oscillations associated with the Earth–ionosphere system. The second is the higher-frequency neural activity associated with particular cognitive and behavioral states. If harmonic coupling exists, the lower-frequency environmental oscillations might influence the timing or coordination of higher-frequency neural activity without themselves carrying the full content of conscious experience. This difference is essential because the existence of a frequency correspondence alone cannot establish information transfer. The same framework provides a possible interpretation of the relationship between conscious and unconscious states. Contemporary neuroscience indicates that thalamic activity and thalamocortical connectivity change substantially across wakefulness, sleep, anesthesia, and disorders of perception. GNER theory proposes that these state-dependent changes could alter the brain's ability to interact with weak environmental signals. In this sense, the gating metaphor used here refers to changes in neural responsiveness and integration rather than a literal switch that turns self-awareness on or off.

The recently identified 19–45 Hz central-thalamic oscillation is particularly interesting in this context. Its presence during wakefulness and REM sleep, and absence during non-REM sleep, suggests that it is associated with particular brain states. The GNER concept predicts that future experiments should determine whether this oscillatory activity is measurably influenced by controlled variation in electromagnetic conditions near the Schumann frequencies. Such an experiment could test whether the observed numerical correspondence represents merely coincidental overlap or a reproducible physiological interaction. The terminal gamma-frequency surge observed in some dying human brains provides another potential point of investigation (see Section 4.2). Studies of dying patients have reported transient increases in organized gamma-frequency neural activity near the time of death. These findings demonstrate an unusual terminal

neural state, but they do not establish that gamma-frequency activity is transmitted from the brain into the environment or that it contains a complete representation of an individual's memories or personality.

The GNER hypothesis proposes a more specific possibility. If biological electromagnetic information can interact with a persistent environmental repository, then the highly synchronized neural activity observed near death could represent a particularly information-rich biological emission. Gamma-frequency activity is attractive as a candidate because it is associated with coordinated neural processing and occupies a frequency range that overlaps multiple harmonics of the Schumann fundamental. The fourth through approximately twelfth harmonics of the 7.8 Hz fundamental fall broadly within the conventional gamma-frequency range. This numerical overlap is therefore hypothesis-generating but has limited evidentiary weight on its own. For the GNER model to gain support, experiments would need to determine whether measurable electromagnetic or photonic signals associated with organized neural activity can leave the biological system, whether those signals persist or interact with environmental materials or fields, and whether information about the originating biological state can subsequently be recovered. Without such evidence, the proposed terminal transfer mechanism remains speculative.

Within GNER, the thalamus is therefore proposed not merely as a neural correlate of altered or conscious states, but as a candidate biological interface through which environmental electromagnetic oscillations could influence neural dynamics. This is a mechanistic hypothesis, not an inference from frequency overlap alone. The relevant prediction is that experimentally controlled changes in environmental electromagnetic oscillations should produce reproducible changes in thalamocortical or related neural activity.

The concept of the “Self” therefore requires an important distinction. The ordinary biological self is clearly dependent upon the functioning brain and body. The theory does not require that autobiographical memory, personality, or conscious awareness continue unchanged after biological death. Instead, it asks whether some measurable physical signature of a living nervous system could persist outside the organism and whether, under some conditions, another nervous system could interact with that signature. In this formulation, the thalamus is not proposed as the sole creator of self-awareness or as a proven gateway to a planetary repository. It is proposed as a biologically plausible site for investigating how distributed neural activity might interact with weak rhythmic environmental influences. The central prediction is therefore experimentally accessible: if environmental electromagnetic oscillations contribute to the timing or integration of thalamocortical activity, controlled alteration of those oscillations should produce reproducible changes in specific neural measures.

The ‘Oneness’ framework therefore treats subjective awareness as a dynamic state arising from interactions among distributed neural systems, without requiring a conclusion about the ultimate nature of self-awareness. The GNER question is whether those interactions are entirely contained within the organism or whether they can also be measurably influenced by the larger electromagnetic environment. The answer remains unknown, but the proposed thalamic mechanism provides a specific biological target through which the question can be investigated. The neural interface therefore provides a possible mechanism for altered perception, but it does

not by itself explain how such experiences might historically have been interpreted as externally originating voices or presences.

6.3 Jaynes's Theory and the GNER Synthesis

Julian Jaynes's *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (1976) prompted speculation by this author shortly after its publication about the possibility of a large-scale electrical field surrounding the Earth and its potential relationship to living systems. At the time, Jaynes's theory was highly unconventional, as was the idea that an electrical environment surrounding the Earth might have biological significance.

Jaynes proposed that ancient human cognition differed substantially from modern self-awareness and that experiences interpreted as the voices of gods, rulers, or ancestors could have originated from internally generated auditory phenomena associated with the organization of the two cerebral hemispheres. His proposed “bicameral” mind remains controversial, and the historical claim that ancient humans generally lacked modern self-awareness is not established since both archeological and literary evidence cuts both ways. The importance of Jaynes to the present hypothesis lies elsewhere: he proposed that the subjective experience of an externally originating voice might arise from a specific relationship between brain organization, perception, and interpretation.

The GNER hypothesis asks whether an additional possibility should be considered. Could at least some experiences historically interpreted as externally originating voices or presences have involved sensitivity to environmental signals in addition to internally generated phenomena? This is not a rejection of Jaynes's neurological explanation. The two mechanisms could potentially coexist, and distinguishing between them would require evidence that is currently unavailable. This possibility becomes more interesting when considered alongside modern evidence that neural oscillations can interact with rhythmic external stimuli and that weak electromagnetic stimulation can, under some experimental conditions, influence subjective experience. If naturally occurring environmental electromagnetic signals can affect neural activity at physiologically relevant intensities, individual differences in neural sensitivity could potentially contribute to unusual perceptual experiences.

An ancient observer would likely not have possessed the conceptual vocabulary to describe such an experience in electromagnetic terms. A perceived voice or presence would instead have been interpreted through the cognitive and cultural categories available to that individual. A voice might therefore have been experienced as belonging to a deceased ancestor, a deity, an angel, or another culturally meaningful entity. The importance of Jaynes to the present hypothesis is therefore not that his bicameral theory is accepted, but that it raises a deeper possibility: experiences interpreted as the voice of a deity, ancestor, or external presence might sometimes reflect an interaction between ordinary neural processes and environmental information that the experiencer does not consciously recognize as external.

In this respect, Jaynes's theory and the GNER concept offer competing but potentially complementary explanations for some historical reports. Jaynes places the source primarily within the organization of the brain; the hypothesis asks whether, in at least some cases, the

environment might also contribute to the experience. The question is not which explanation is philosophically more attractive, but whether the two mechanisms can be experimentally distinguished. The resulting prediction is straightforward: if individual differences in neural sensitivity to weak environmental electromagnetic signals contribute to anomalous experiences, individuals reporting such experiences should exhibit measurable physiological or perceptual differences under controlled internally generated vs. environmentally influenced electromagnetic and sham conditions. Such differences would not establish the GNER, but they would provide a means of testing one of its proposed biological interfaces.

6.4 Long-Term Cycles, Solar Activity, and Cultural Synchrony

The GNER model generates a specific historical prediction. If biological electromagnetic information can accumulate within the proposed repository, and if extreme solar events can substantially disrupt that accumulation, then periods of increased anomalous experience, spiritual activity, philosophical innovation, and cultural transformation should show measurable temporal relationships to major solar and geomagnetic events. If the GNER hypothesis is correct, one possible consequence would be that periods of unusual spiritual and philosophical activity could reflect changes in the environmental conditions under which human cognition operates. The significance of the hypothesis is therefore not that solar activity “caused” philosophy or religion, but that a shared environmental variable could have contributed to conditions under which similar questions emerged independently in geographically separated societies.

The most extensively documented correlation between solar activity and human cultural output is the work of Russian scientist Alexander Tchijevsky, who in the early twentieth century systematically catalogued the relationship between the eleven-year solar cycle and the incidence of mass human activity — wars, revolutions, migrations, and cultural upheavals — across 2,500 years of recorded history (Tchijevsky 1971). Tchijevsky's historical work provides an intriguing precedent for investigating relationships between solar variability and human behavior. He reported associations between phases of the approximately eleven-year solar cycle and periods of increased collective human activity. Later work has questioned aspects of Tchijevsky's methodology, and so his interpretation of these historical correlations remains controversial, and the mechanisms, if any, are not established. Nevertheless, the possibility that solar variability could influence terrestrial biological or behavioral systems provides a relevant empirical context for the GNER theory.

The GNER model proposes a different mechanism from the one implied by a simple solar-activity correlation. Rather than suggesting that solar activity directly produces cultural change, it predicts that changes in the terrestrial electromagnetic environment could alter the persistence, coupling, or accessibility of biological electromagnetic information. This distinction makes the proposed mechanism experimentally separable from a general “solar influence on behavior” hypothesis.

The longer-timescale periodicity proposed by this model is substantially different from the familiar eleven-year solar cycle. There appears to be a long-timescale pattern in historical/cultural activity on the order of several centuries; extreme solar events provide independently identifiable chronological markers; and the hypothesis proposes that the

relationship between the two may be mediated by changes in the terrestrial electromagnetic environment. Extreme solar-particle and geomagnetic events occur at irregular intervals, with estimates spanning roughly centuries to millennia depending upon event magnitude and the definition of the event. The approximately 500-year periodicity considered here therefore represents a proposed characteristic timescale, not a fixed solar cycle. Páleš & Mikulecký (2008) proposed a striking pattern of approximately 500-year intervals in spiritual and philosophical activity across geographically separated cultures with no plausible mechanism of direct cultural transmission, interpreted as potentially related to solar activity. The electromagnetic rather than neuroendocrine mechanism proposed here is distinct from Páleš & Mikulecký's interpretation.

Independent support for a solar-cultural relationship comes from Vladimírsky (2022), who analyzed the Axial Age and subsequent bursts of spiritual and philosophical activity across European and Chinese history using solar activity indices. Employing electromagnetic biophysics and neurophysiology, Vladimírsky identified the operative psychotropic space factor as very low frequency radio waves of magnetospheric origin and infrasound, and found that creativity in the rational sphere is specifically stimulated during grand solar *minima* rather than maxima. This finding is particularly relevant to the GNER mechanism: a grand solar minimum would reduce the disruptive influence of extreme solar-particle events on the proposed repository, potentially allowing accumulated biological electromagnetic information to reach a threshold of environmental density. The convergence of Vladimírsky's electromagnetic biophysics framework with the GNER prediction — arrived at through an independent methodological path — provides additional empirical context for the proposed solar-cultural relationship. These findings do not establish a planetary electromagnetic driver, but they provide another body of observations against which the GNER prediction could be tested.

As noted above, the most dramatic single instance of this pattern is the Axial Age. Between approximately 800 and 200 BCE, several major Eurasian civilizations underwent significant and partly overlapping transformations in philosophy, ethics, religion, and concepts of human identity—developments later grouped by Karl Jaspers under the term ‘Axial Age’ (Jaspers 1953). Jaspers himself noted that no satisfactory explanation for this simultaneity had ever been proposed. Examples include Socrates, Plato, and Aristotle in Greece; Zoroaster in Persia; the authors of the Upanishads and the Buddha in India; Confucius, Laozi, and Mencius in China. The near-contemporaneous emergence of major philosophical and religious traditions across geographically separated civilizations presents an intriguing historical pattern that warrants systematic examination. A possible 660 BCE Miyake-class solar particle event (see Section 3.4) documented in tree-ring carbon-14 records could provide a chronological marker, though exact dating remains under investigation. If extreme solar-particle events substantially disrupt the persistence of biological electromagnetic patterns within the proposed repository, the subsequent centuries provide a natural interval in which to ask whether biological or cultural signals accumulated at a measurable rate. The hypothesis would predict that independently defined measures of anomalous experience, spiritual activity, or cultural innovation should show a statistically detectable relationship to that interval. If the proposed accumulation mechanism existed, the subsequent centuries would represent a period during which measurable signal density might have increased. Whether historical reports of spiritual or anomalous experience reflect interaction with such an environment is an empirical question rather than an established interpretation.

The pattern suggests additional historical comparisons. The Islamic Golden Age (roughly 750–1258 CE) overlaps the centuries following the AD 774–775 Miyake event (Miyake et al. 2012), while the European Renaissance (roughly 1300–1600 CE) follows the AD 993–994 Miyake event (Miyake et al. 2013) by a broadly comparable interval. The AD 774–775 event precedes the Islamic Golden Age's intellectual peak by roughly 50–200 years, a lag broadly consistent with the proposed accumulation interval. The historical significance of this possibility is considerable. Human civilization did not merely produce isolated mystical experiences; it repeatedly produced traditions centered on connection, compassion, unity, transcendence, moral restraint, and the relationship between individual life and a larger whole. If the GNER model is correct, these recurring themes might reflect not only cultural transmission and psychological development, but also repeated interaction between human nervous systems and a persistent physical environment. These temporal relationships are intriguing, but they cannot presently distinguish the GNER concept from coincidence, conventional historical explanations, or other environmental and social variables. Their value lies in generating a quantitative question: if the GNER model predicts a characteristic accumulation interval following extreme solar events, can that interval be detected statistically in independently measured cultural and behavioral data? The lag between an extreme solar event and any subsequent cultural maximum would therefore become a testable parameter of the model.

These historical examples do not establish the GNER as fact. They do, however, suggest a potentially testable research program. If extreme solar events can disrupt a persistent biological electromagnetic environment, and if that environment subsequently accumulates information over time, independently measured indicators of anomalous experience, cultural activity, and biological response should exhibit temporal structure relative to those events. The important question is whether these predictions survive controlled testing and attempts at falsification.

7. Proposed Empirical Methodologies

The GNER hypothesis offers specific components that are falsifiable and open to direct empirical testing. To investigate the proposed interface mechanism, experimental protocols must isolate the role of environmental electromagnetic entrainment. Researchers could conduct comparative electroencephalographic (EEG) monitoring of meditating subjects resting in baseline, unshielded environments and then in controlled electromagnetic shielding environments. A properly characterized combination of electric-field and magnetic-field attenuation (on the order of 20–40 dB attenuation at Schumann frequencies, achievable with existing Faraday enclosure designs) could be used to reduce electromagnetic activity in the vicinity of the Schumann resonance (7.83 Hz fundamental and harmonics), with the actual degree of attenuation measured independently rather than assumed. Subjects in the attenuated environment could then be evaluated for changes in spontaneous alpha/theta activity, cross-frequency synchronization, or other prespecified EEG measures, e.g., gamma-band coherence, theta burst activity.

A first experimental test should be designed as a controlled, blinded comparison rather than as an open-ended search for correlations. EEG recordings would be obtained under baseline and experimentally attenuated environmental EM conditions, with the degree of attenuation independently measured at the participant's location. Condition order should be randomized,

sham shielding included, and participants and analysts blinded where practical. The primary analysis should use predefined spectral or phase-synchronization measures, with cross-frequency coupling and gamma-band coherence treated as secondary outcomes.

If attenuation of the relevant environmental frequencies produced a reproducible neural effect that exceeded changes observed under sham-shielded conditions, this would provide evidence that the terrestrial electromagnetic environment can influence neural activity under controlled conditions. It would not by itself confirm the existence of GNER, but it would support further investigation of the proposed planetary-neural coupling mechanism. Conversely, a consistent failure to produce such effects would weaken an important component of the hypothesis. A second stage of research could investigate whether individuals who report unusually frequent anomalous perceptions show greater physiological sensitivity to weak environmental electromagnetic variation than matched control subjects. Such experiments could compare EEG and other physiological measures under precisely characterized electromagnetic and sham conditions while controlling for expectation, suggestion, sensory deprivation, and other potential confounding variables.

A longer-term research direction could also investigate whether neurological function changes when organisms are exposed for prolonged periods to environments substantially different from Earth's natural electromagnetic environment, including carefully controlled shielding conditions and, eventually, environments beyond significant terrestrial geomagnetic influence, including extended spaceflight conditions. Such studies would require extensive controls because many other environmental variables change simultaneously outside the magnetosphere. The primary contribution of this model is therefore to provide a coherent theoretical framework that generates specific, experimentally testable hypotheses across several fields. The critical question is not whether the GNER interpretation can be made to fit an observed result, but whether its predictions can survive controlled testing and attempts at falsification.

The scientific questions, however, lead back to the philosophical problem that motivated the hypothesis in the first place – the many and varied interpretations of and responses to perceptions of similar planetary and neurological interactions mentioned by cultures separated by both time and distance.

8. Reconciling the Blind Men

The GNER hypothesis provides a possible biophysical framework for reconsidering the “Blind Men and the Elephant” religious paradox. The “Blind Men and the Elephant” is more than a convenient metaphor for religious disagreement. It may capture a fundamental problem in how human beings interpret experiences that exceed the explanatory tools available to them. If GNER is correct, different cultures may have encountered different manifestations of a natural phenomenon and translated those experiences into the categories of angels, demons, ancestors, ghosts, revelation, mystical union, or Oneness. In this analogy, the Elephant represents the larger biophysical phenomenon proposed by the model: an Earth–ionosphere environment that could, if the hypothesis is correct, interact with biological electromagnetic and photonic activity. The Blind Men represent human observers attempting to perceive and interpret different components

of it through the perceptual and cultural tools available to them. Within this framework, different anomalous experiences could potentially arise from different signal conditions or different modes of neural interpretation. One individual might interpret an unusual perceived presence as an Angel; another might interpret a disturbing or incompatible experience as a Demon. A person experiencing a localized environmental phenomenon might describe it as a ghost. A philosopher experiencing a diffuse sense of interconnectedness might describe the experience as Oneness. A shaman or religious authority could interpret such experiences through the conceptual and cultural vocabulary available to that society.

These examples should not be understood as evidence that angels, demons, ghosts, or deities have been demonstrated to be electromagnetic phenomena. Rather, they illustrate how the same underlying environmental mechanism, if one exists, could potentially produce very different subjective interpretations depending upon the signal encountered, the sensitivity of the individual, and the cultural framework through which the experience is understood. The analogy therefore offers a possible explanation for an otherwise persistent feature of religious history: similar reports of presence, revelation, interconnectedness, communication with the dead, and encounters with supernatural beings appear in widely separated cultures, yet the interpretations assigned to those experiences vary considerably. The hypothesis proposes that some portion of this variation could arise from differences in the underlying signals being encountered and differences in the neural and cultural systems used to interpret them.

This understanding also provides a possible physical perspective on the recurring distinction between direct experience and institutional interpretation. If unusual experiences originate partly from interactions between biological nervous systems and environmental signals that are not yet scientifically characterized, individuals experiencing them would have no inherent means of knowing their physical source. They would naturally interpret them using the explanatory categories available to them. Over time, those interpretations could become incorporated into religious traditions, philosophical systems, and social institutions. From this perspective, ancient philosophers and religious thinkers may have been attempting to describe genuine subjective experiences without possessing the scientific concepts necessary to distinguish their possible sources. That does not establish that their interpretations were physically correct. It suggests instead that some historical descriptions of spiritual experience might be valuable as phenomenological records even when their traditional explanations are not scientifically testable.

The GNER hypothesis therefore does not require the conclusion that all religious experiences have a single cause. Ordinary psychological processes, cultural conditioning, neurological disorders, altered states, deliberate religious practice, and other mechanisms could account for many such experiences. The narrower proposal is that a subset of anomalous experiences may eventually prove to have an environmental electromagnetic component that is currently unrecognized. The hypothesis also raises a more speculative possibility of reciprocal influence. The relationship between the proposed environmental phenomenon and human culture may not be unidirectional. If unusual environmental electromagnetic interactions have affected human perception over very long periods, and if individuals capable of detecting such signals have influenced cultural practices and patterns of attention, those cultural practices could in turn have affected the development or selection of neural traits associated with sensitivity. In that

scenario, biological evolution, cultural evolution, and environmental electromagnetic conditions could form a long-term feedback system. This remains a speculative extension of the GNER model rather than an established evolutionary mechanism.

If the underlying phenomenon is real, the Blind Men metaphor acquires a second meaning. Different cultures may have encountered different aspects of a larger phenomenon and then translated those experiences through their own languages, expectations, and institutions. The resulting traditions would not necessarily be entirely correct or entirely mistaken; each might preserve a partial interpretation of something more complex than any single tradition could describe. The “Blind Men and the Elephant” analogy therefore serves not as proof of the GNER hypothesis but as a conceptual summary of its central proposition: apparently different spiritual experiences might, in some cases, represent different interpretations of components of a common underlying natural phenomenon. Whether such a phenomenon exists is ultimately an empirical question, one which is considered more strenuously within the next section.

9. Limitations and Open Questions

The connections between these biophysical pillars identify several areas in which substantial evidence is still required. The most fundamental question concerns the proposed repository itself: can a planetary-scale electromagnetic environment preserve any measurable information derived from biological activity, or would such signals rapidly dissipate beyond meaningful recovery? Here, ‘biological information’ refers operationally to measurable features of an emitted signal that correlate reproducibly with characteristics of its biological source, rather than to stored memories or subjective experience. Answering this question requires identifying a specific physical mechanism for encoding, preserving, and potentially retrieving biological information within the Earth–ionosphere environment. A related question concerns the proposed coupling between biological electromagnetic and photonic emissions and the larger environmental field. The GNER hypothesis does not require quantum entanglement or instantaneous transmission, and no such mechanism has been demonstrated. The more conservative question is whether measurable electromagnetic or photonic emissions associated with organized biological activity can interact with environmental electromagnetic structures at all, and whether any resulting signal can persist at a level distinguishable from background noise. Experiments using controlled biological sources, calibrated electromagnetic measurements, and carefully characterized environmental conditions could begin to address this question. Shielded and sham conditions should be randomized and, where practical, participants and EEG analysts should remain blinded to condition (see Section 7).

The proposed material-storage mechanism presents a second major uncertainty. Dense materials may possess physical properties capable of retaining particular forms of information, including magnetic remanence, charge trapping, polarization, or other metastable states. However, there is currently no evidence that ordinary stone, masonry, or household metals routinely preserve transient electromagnetic signatures generated by human nervous systems. This theory requires direct experimental investigation rather than an assumption that all dense materials function as biological recording media. Recent research into unusual condensed-matter systems demonstrates that material structure can produce electromagnetic properties that are not obvious from the bulk composition alone. Rhombohedral multilayer graphene, for example,

exhibits unusual correlated electronic and magnetic states that have expanded the range of known behaviors in two-dimensional materials (Li et al. 2026). Such systems do not demonstrate that environmental materials store biological emanations, and they should not be treated as evidence for that proposition. Their relevance to GNER is narrower: they illustrate why the electromagnetic and memory-related properties of candidate materials cannot always be inferred from their ordinary macroscopic appearance or composition. This offers additional justification for experimentally testing whether particular natural materials can retain weak, structured electromagnetic inputs under controlled conditions.

Another unresolved issue concerns the proposed receiver mechanism. If human beings can interact with extremely weak environmental electromagnetic signals, what neural characteristics permit such interaction? The GNER concept predicts that individual differences in neural sensitivity, filtering, entrainment, or thalamocortical integration could influence susceptibility to anomalous perceptual experiences. Temporal-lobe function may also warrant investigation because of its established relationship to memory, perception, and unusual subjective experiences. However, no particular brain structure should presently be identified as the proven anatomical receptor for a planetary signal. The appropriate approach is to determine experimentally whether people reporting unusually frequent anomalous experiences show reproducible physiological differences from matched control participants under controlled electromagnetic conditions. The same caution applies to the terminal gamma-frequency activity observed in some dying human brains. These observations demonstrate that organized neural activity can occur during the final stages of physiological collapse, but they do not demonstrate that a complete representation of personality, memory, or self-awareness is transmitted outside the brain. The observation also establishes that organized neural activity persists into physiological collapse; whether any external signature is produced remains a separate, currently untested question. Future experiments would need to determine whether organized neural activity produces measurable external electromagnetic or photonic signatures and, critically, whether any information about the originating biological state can subsequently be detected or recovered.

The relationship between terrestrial electromagnetic conditions and human neurological function also remains unresolved. The existence of the Schumann resonances is well established, while the biological significance of exposure to weak environmental electromagnetic fields remains an active area of investigation. Studies of hypomagnetic environments by NASA and Chinese research teams have reported biological effects in experimental systems and have identified possible relevance to future space exploration, but the magnitude, mechanisms, and human significance of these effects remain uncertain (Beischer et al. 1967; Xue et al. 2021). These findings therefore provide a reason for further investigation, not definitive evidence that human beings are dependent upon the Earth's electromagnetic environment in the same manner as air, water, or food.

A logical extension of this research would be to examine environments in which Earth's natural electromagnetic conditions are substantially altered. Controlled terrestrial shielding experiments provide the most immediate test of the proposed interface mechanism. Longer-duration studies of hypomagnetic environments, including those relevant to spaceflight, could eventually provide an additional test of whether removal from Earth's electromagnetic

environment produces reproducible neurological or perceptual effects. Such effects, if found, would still require careful separation from radiation, microgravity, isolation, circadian disruption, and other conditions associated with space travel. These limitations do not invalidate the GNER hypothesis; they define the experiments required to evaluate it. Several components of the model can already be investigated independently: the measurable properties of the Earth–ionosphere electromagnetic environment; biological ultraweak photon and electromagnetic emissions; neural oscillatory responses to controlled electromagnetic conditions; the ability of candidate materials to retain weak biological signals; and individual differences in responses to such signals. Positive results in these individual areas would not automatically establish the complete GNER model, but convergent evidence across multiple levels would provide progressively stronger support.

The principal scientific contribution claimed here is therefore not a definitive explanation of subjective experience or spiritual phenomena, nor evidence that spiritual experiences have already been demonstrated to possess a planetary electromagnetic origin. It is a testable framework linking several otherwise separate questions: whether biological activity produces persistent physical signatures, whether environmental electromagnetic systems can interact with those signatures, whether neural systems can detect such interactions, and whether some anomalous experiences could result from that interaction. The model treats self-awareness as arising from biological processes while asking whether those processes are also embedded in a larger electromagnetic environment capable of influencing them in ways not yet fully understood. The thalamus is proposed as one plausible neural component through which such interaction might occur. Likewise, the GNER is proposed as a possible physical repository, not an established planetary memory system. The larger ambition of the model is to investigate whether biological function and planetary electromagnetic environment are more deeply connected than current disciplinary boundaries assume. If even part of that relationship can be demonstrated, it would provide a physical context in which some longstanding philosophical questions about consciousness, connectedness, and spiritual experience could be reconsidered.

At this stage, what matters is the set of empirical questions the hypothesis makes possible. If controlled experiments repeatedly fail to detect the predicted interactions, the corresponding components should be abandoned. If reproducible electromagnetic, material, and neurological effects are observed and survive appropriate controls, the larger synthesis would warrant progressively more rigorous investigation. In that sense, the GNER hypothesis is best regarded as a starting point: an attempt to organize a set of observations concerning biological emissions, neural oscillations, planetary electromagnetic phenomena, anomalous perception, and the persistence of physical information into a single framework that can be subjected to measurement. Whether those observations ultimately prove to be connected remains an open scientific question. The philosophical questions that motivated the hypothesis, however, do not disappear simply because the answers remain uncertain. Human beings have spent millennia asking whether individual existence is bounded entirely by the organism, whether life is connected in ways not immediately apparent, whether something of a person can persist beyond death, and whether compassion and connection reflect something deeper than social convention. GNER does not answer those questions. It proposes that at least some of them may eventually be approachable through physical measurement.

The purpose of this framework is therefore broader than identifying another electromagnetic effect on the nervous system. It asks whether some of the oldest human intuitions about connectedness, spiritual presence, consciousness, and life after death might ultimately have physical counterparts. Those questions have traditionally been divided between science, philosophy, and religion. GNER proposes that they may not be as independent as they appear. The hypothesis is falsified at its core if controlled experiments consistently fail to detect measurable biological electromagnetic emissions capable of interacting with environmental structures, or if no reproducible neural response to controlled Schumann-frequency stimulation can be demonstrated. Convergent positive results across the proposed experimental levels, by contrast, would justify progressively more ambitious investigation of the complete model.

10. Conclusion

This biophysical model offers a radical perspective on one possible source of some religious experiences, a scientific expression of an intuition that humanity has been describing, imperfectly and in many different languages, for thousands of generations. These remarkably persistent ideas concerning spiritual presence, interconnectedness, life after death, reunion with the dead, moral behavior, and some form of ultimate unity have taken profoundly different forms, and no single explanation can reasonably account for all of them. Yet their persistence raises an enduring question: why have human beings repeatedly experienced and described some form of connection to a larger whole? The GNER hypothesis proposes that at least some of these ideas may have arisen not solely from philosophical speculation or cultural invention, but from recurring human experiences that were interpreted through the conceptual and symbolic languages available to each society.

Individuals who reported experiences of presence or Oneness did not possess the scientific terminology necessary to describe electromagnetic, neurological, or environmental phenomena in modern terms. If the GNER proposition is correct, some of those individuals may have perceived aspects of a physical phenomenon that they could only understand through the religious and cultural frameworks of their time. The resulting descriptions would naturally differ from culture to culture even if some underlying experiences were shared. Within this framework, the recurring human intuition of connectedness takes on a potentially physical dimension. A life characterized by empathy, cooperation, attachment, and profound interpersonal bonds could represent more than a psychological or moral condition if biological signatures are capable of interacting within a larger environmental system. What religious traditions have described as spiritual unity, Oneness, or communion might then have a physical counterpart: measurable interaction among biological systems embedded within the same planetary environment.

The same possibility provides a speculative biophysical interpretation of humanity's ancient ideas about what happens after death. What this paper calls harmonically entangled signatures should therefore be understood here as a proposed physical relationship, not demonstrated quantum entanglement. If some measurable physical signature of biological activity can persist beyond the organism, then the traditional concepts of Heaven, Paradise, or Nirvana might be interpreted as states of integration or continued coupling, while Hell, Gehenna, or the abyss might represent fragmentation, isolation, or loss of meaningful connection. These interpretations are not presented as demonstrated properties of an afterlife. They are possible

physical analogues to ideas that have appeared independently, or nearly independently, across human cultures. The comforting promise of reuniting with loved ones could likewise acquire an unexpected physical interpretation. If biological signatures persist within a common environmental system and retain some degree of information about the originating organism, then the possibility of subsequent interaction among compatible signatures would provide a naturalistic analogue to the ancient idea of reunion. Whether any such persistence, compatibility, or retrieval is possible remains one of the central empirical questions raised by the model.

This perspective may also offer a different way of considering the moral dimension of religion. Religious traditions have clearly served many social and institutional purposes, including community cohesion, political organization, ethical instruction, and explanations of the natural world. It would therefore be unjustified to assume that their moral systems originated from a single source. Yet the remarkable recurrence of teachings emphasizing compassion, cooperation, empathy, restraint, and connection is nevertheless intriguing in the context of GNER. If human beings are physically embedded in a larger interconnected biological environment, then behaviors that strengthen social bonds may have consequences extending beyond the individual in ways that purely psychological or sociological explanations do not capture. Here, the earliest moral teachings need not have been deliberate instruments of social control. They could instead represent humanity's accumulated attempt to understand experiences of connection and separation and to formulate behaviors believed to preserve that connection. Religious traditions may subsequently have transformed those insights into doctrines, rituals, institutions, and systems of authority.

The original experience and the later institution need not have been the same thing. The “Blind Men and the Elephant” therefore becomes more than an analogy for religious disagreement. It becomes a possible description of the historical problem itself. Different observers may have encountered different aspects of a complex phenomenon and interpreted those experiences according to their own sensory limitations, neurological characteristics, cultural assumptions, and inherited traditions. One person might describe a sensed presence as an angel; another as a demon; another as an ancestor or ghost. A mystic might experience the diffuse integration of many signals as Oneness. Each interpretation could contain an element of an underlying experience without any one interpretation providing a complete description of the whole. The historical problem, in this view, arises when one interpretation of the elephant becomes identified with the elephant itself. Religious conflict can then emerge not necessarily because the underlying spiritual impulse was false, but because partial human interpretations became institutionalized as exclusive truths. This does not mean that all religions are secretly describing the same physical phenomenon, nor that every spiritual experience has an electromagnetic origin. Ordinary psychology, neurological processes, cultural conditioning, altered states, and many other mechanisms undoubtedly contribute to religious experience. The narrower GNER proposition is that some portion of those experiences may ultimately prove to have an additional environmental component.

This possibility also offers a different interpretation of the word “Oneness.” Across cultures, the concept has often been expressed as spiritual unity, communion, interconnectedness, or dissolution of the boundary between self and the larger whole. GNER asks whether that recurring human intuition could have a physical correlate. The individual

would remain a distinct biological organism, but would nevertheless participate in an electromagnetic and biological environment that extends beyond the boundaries of the body. If such a relationship were eventually demonstrated, the philosophical consequences would be substantial. The distinction between self and environment would remain biologically real, but it would no longer represent a complete description of the individual. A human being would be both an autonomous organism and a participant in a larger physical system. Individual existence would remain individual, while connectedness would acquire a measurable dimension.

This is ultimately the direction in which the GNER hypothesis attempts to bring science and spiritual philosophy into conversation. It does not require science to validate every religious claim, nor does it require religion to abandon its philosophical and ethical traditions. Instead, it asks whether some of the experiences from which those traditions arose may have a physical basis that has not yet been recognized. The scientific evidence presented in this paper does not establish that conclusion. The existence of the Earth–ionosphere electromagnetic environment, biological electromagnetic and photonic emissions, organized neural oscillations, thalamocortical integration, and unusual terminal neural activity are individually established areas of investigation. The proposed connection among them remains speculative. The purpose of the hypothesis is to identify that connection as a question that can be tested rather than simply believed or dismissed. If future experiments demonstrate that biological signatures can persist within environmental electromagnetic systems, that neural systems can detect or interact with those signatures, and that some anomalous experiences are associated with such interactions, then an unexpected bridge between neuroscience and longstanding spiritual ideas may emerge. If those experiments fail, the corresponding portions of the model should be abandoned or revised. But if even part of the proposed connection survives rigorous investigation, the philosophical implications could be profound. The ancient intuition that life is interconnected would no longer belong exclusively to religion or philosophy. It could become, at least in part, a question of physical measurement.

In that sense, the ultimate proposition of this paper is neither that science has disproved spirituality nor that religion has already discovered hidden physics. It is that the two may have been approaching the same fundamental question from opposite directions: What is the true boundary of the individual, and how deeply are we connected to the larger living world? The GNER hypothesis proposes that the answer may extend beyond the skin, beyond the brain, and perhaps beyond the conventional boundaries we have placed around the self. In this light, Oneness is not merely a philosophical belief or a theological concept; it may represent a measurable biophysical relationship among living systems— a continuous presence in the living structure of the world.

11. AI Declaration Statement

Generative AI was used during the preparation of this manuscript as an editorial and research-assistance tool, including copyediting, structural revision, identification of potential scientific overstatements, and discussion of clarity and presentation. The underlying GNER hypothesis, its originating concepts, and the central theoretical model were developed independently by the author over several decades. The author is solely responsible for the manuscript's hypotheses, interpretations, conclusions, and final wording.

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