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EDITORIAL

Rediscovering Cryptozoology as an Integrative Science

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"Monster" is a prejudicial term that conjures fear, grotesquerie, and moral judgment, yet its visceral appeal sells books, documentaries, and headlines. "Cryptozoology," in contrast, is a moniker that has drifted from public view despite addressing a far broader set of phenomena than tabloids suggest. Defined broadly, cryptozoology encompasses not only putative "unknown or hidden" fauna but also a host of other animal-like phenomena that resist straightforward scientific classification (Coleman & Clark, 1999; Simpson, 1984). In particular, the taxonomy of cryptids might reasonably include traditional fauna unknown to science, taxa once considered mythical but later validated, culturally-embedded motifs like werewolves (de Blécourt, 2007) or other shape-shifters (Kachuba, 2023), folklore-type beings such as "little people" and anomalous humanoids that often overlap with ghosts and extraterrestrials (Evans, 1987; Hernandez et al., 2018; Houran, 2000; Kumar & Pekala, 2001), as well as "entity encounters" during psychedelic (e.g., Davis et al., 2020) or spontaneously occurring transcendental states (e.g., Houran, 2025). To be sure, it is not always apparent whether such interactions involve material or immaterial "creatures."

Critics therefore understandably argue that "pure" cryptozoology has been muddled by the inclusion of esoteric phenomena. While such topics may merit investigation and can be tangentially related, it seems unlikely they are biologically grounded. Their presence tends to distort datasets and discourage academic participation. Many of these paranormal subjects also draw heavily from popular culture, contributing to definitional creep and blurring the boundaries of cryptozoology as a zoological discipline. Although scientists have historically engaged with ideas now associated with cryptozoology, the term was coined by zoologist Ivan T. Sanderson in the early 1940s and first appeared in print in his 1961 work *Abominable Snowmen: Legend Come to Life* (cf. Heuvelmans, 1968, p. 33). The word derives from the Greek *kryptos*, meaning "hidden, unknown, or secret," combined with zoology, the study of animals (Mackal, 1980). Sanderson also investigated UFOs and other anomalies, but he generally kept these pursuits separate from zoological research. Belgian zoologist Bernard Heuvelmans (1986) later expanded Sanderson's framework with an annotated checklist of unknown animals ("cryptids"), including: (a) species or subspecies apparently unknown to science, such as alleged prehistoric survivors; (b) species or subspecies known from historical records but presumed extinct, yet claimed to persist; (c) known species or subspecies reported outside their scientifically recognized geographic ranges; (d) known species or subspecies allegedly introduced or occurring artificially outside their accepted ranges; and (e) unrecognized, non-taxonomic variants of known species or subspecies.

Rather than dismiss cryptozoology as mere myth-chasing, we should therefore appreciate how its themes resonate within legitimate zoological and social-scientific arenas. When folklore and fieldwork intersect, the line between cultural imagination and biological reality can blur—and sometimes spectacularly.

HISTORICAL PRECEDENTS AND EMBLEMATIC EXAMPLES

Following from the above, the narwhal (*Monodon monoceros*) long inspired medieval and early modern European accounts of the "unicorn," with its long tusk treated as magical horn until naturalists confirmed the animal's existence and clarified the tusk's biological origin (Pluskowski, 2004). The giant squid (*Architeuthis dux*) underlies mariners' kraken and sea-monster stories; once dismissed as sailor's lore, specimens and deep-sea observations have shown that very large squid are real, anchoring a folkloric archetype to legitimate biology (Salvador & Tomotani, 2014). Recent examples further illustrate how animals once treated as rumor or local lore were documented scientifically. The Laotian rock rat was formally described as *Laonastes aenigmamus* after local reports of the "kha-nyou" signaled a previously unrecognized lineage (Jenkins et al., 2005). The saola (*Pseudoryx nghetinhensis*), long a subject of local rumor in the Annamite Range before its formal recognition, was described in the early 1990s and transformed regional legend into an urgent conservation priority (Dung et al., 1993). The New Guinea "singing dog," once thought extinct in the wild, has been confirmed by field observations and genetic studies in the 2010s, corroborating Indigenous and local knowledge about a distinctive wild canid (Surbakti et al., 2020).

And beyond such conventional cryptids lie more liminal "entities"—figures that straddle biomedical plausibility and mythic ambiguity. These beings hover at the thresholds of human and animal, life and death, and the terrestrial and the transcendent. They include vampires (Maas & Voets, 2014), zombies (Charlier, 2017), Men-in-Black (Rojcewicz, 1987), angels (Lange & Houran, 1996), demons and possession phenomena (Escolà-Gascón et al., 2023), tulpas and other mental-energy constructs (Little et al., 2021), and even the real-world predatory monsters known as serial killers (Federal Bureau of Investigation, 2005). Only time will reveal the ultimate nature of these reported phenomena, along with the most famous cryptids in our cultural history, i.e., the Loch Ness Monster (or "Nessie": Bauer, 2002), Sasquatch (or "Bigfoot": Meldrum, 2006), El Chupacabra (or "the goat sucker": Tomeček et al., 2017), and Mokele-Mbembe (the so-called "living dinosaur": Mackal, 1987).

Treating cryptids as a spectrum or complex family tree rather than a single problem clarifies why interdisciplinary protocols, ethically attuned fieldwork, and transparent evidentiary standards are essential to separate genuine biological surprises from culturally-meaningful phenomena and information artifacts. Moreover, each class raises distinct empirical questions, methods, and risks. Ecological surveys and environmental-DNA techniques suit putative biological taxa; ethnography and narrative analysis suit folklore-laden reports; cognitive and perceptual experiments suit anomalous experience; and forensic media analysis suits contested visual evidence. This pluralistic framing broadens tractable research questions and helps to explain why reports of human-like cryptids often attract disproportionate attention: humanoid reports tap familiar social schemas, emotional resonance, and narrative plausibility in ways that anonymous-animal reports do not. Integrating these divergent perspectives yields the strongest explanatory framework by testing material claims against cognitive and cultural processes and recognizing that physical stimuli and symbolic meaning can co-produce cryptozoological relevant narratives (see e.g., Mayor, 2005).

Consider the example of "dragons," a mythical creature typically depicted as a large, powerful reptile—often winged and fire-breathing—that appears in the folklore and mythology of cultures around the world. Some scholars have argued that encounters with large, fossilized bones helped to stimulate and reshape dragon imagery across cultures, as people interpreted exposed bones as the remains of giant serpents or monsters, thereby amplifying dragon traditions (Mayor, 2005, 2023; Rudwick, 1985). Other researchers emphasize psychological or cultural origins, namely, the idea that dragon and rainbow imagery often converge because both are tied to liminal, watery, or atmospheric forces—dragons exemplify storms, rivers, and rain, while rainbows serve as visible manifestations of those same conditions—so storytellers personified the luminous arc as a serpentine or draconic figure, producing motifs such as the "Rainbow Serpent" (Blust, 2023; Leeming, 2005).

This framework gains further traction when applied to historical cases, as presented earlier, where tangible

evidence intersects with myth-making. The examples of narwhal tusks, giant squid carcasses, and fossil bones illustrate how material traces can give rise to enduring myths, underscoring the need for coordinated natural history investigations alongside forensic, ethnographic, and cognitive protocols.

PAST CHALLENGES AND RECENT STRIDES

The International Society for Cryptozoology (ISC) emerged in 1982 as an effort to legitimize the study of hidden animals, publishing the journal *Cryptozoology*, an *ISC Newsletter*, and hosting annual conferences to promote the field (cf. Clark, 1993; Cryptid Archives Wiki, n.d.; Loxton & Prothero, 2013). By the late 1990s the ISC suffered declining membership, limited academic acceptance, and financial strain; its journal ceased in 1996, and the society dissolved in 1998, with a brief, unsuccessful revival in 2004. The ISC's rise and fall exemplifies the broader struggles fringe sciences face in gaining lasting institutional support and reveals how institutional dynamics shape which anomalous reports receive sustained scientific attention. Subsequent work by author and researcher Loren Coleman can be considered an extension of ISC's mission. His stewardship of archives, publications, and public outreach has preserved much of the society's documentary legacy, while reframing cryptozoology as a museum-centered, publicly engaged field. The resultant International Cryptozoology Museum (Portland, Maine) functions as a living archive and outreach platform that sustains public interest, provides continuity for scattered records, and bridges popular fascination with efforts at more systematic documentation and scholarship.

Cryptid encounters remain common in contemporary culture—sightings of sasquatch, lake monsters, winged humanoids, and phantom felids generate a substantial archive of qualitative and material evidence in local news, amateur footage, and community investigations. Studying these reports does not demand endorsing extraordinary ontologies (cf. Schooler et al., 2018); it demands disciplined curiosity about what the evidence might reveal biologically, ecologically, cognitively, socially, and institutionally. Historically, unidentified-animal reports have prompted bona fide discoveries and range revisions, and systematic fieldwork—careful documentation, camera-trap grids, passive acoustic arrays, and targeted environmental DNA (eDNA) sampling—can separate misidentification from genuinely anomalous signals while strengthening local conservation knowledge. eDNA metabarcoding, which identifies multiple species from environmental samples by sequencing genetic markers and comparing them to reference databases, has proven sensitive and cost-effective for detecting rare or cryptic taxa in aquatic and terrestrial settings (Deiner et al., 2015; Ruppert et al., 2019; Xiong et al., 2022). Meta-analyses indicate eDNA often outperforms conventional surveys in detection rates (Fediajevaite et al., 2021), yet reliability hinges on protocol details—sample volume, capture medium, contamination controls, and replication—so rigorous standards are essential (Deiner et al., 2015; Goldberg et al., 2016; Xiong et al., 2022).

These empirical successes and methodological advances set the stage for a focused inventory of recent discoveries and rediscoveries that demonstrate the value of targeted field efforts. In particular, Table 1 summarizes notable discoveries and rediscoveries of species reported between 2000 and 2025 and is intended to illustrate recent, empirically documented instances where anomalous reports or concentrated field effort produced taxonomic novelty or important conservation-relevant findings. The table lists each species by scientific and common name, classifies the entry as a "New" description or a "Rediscovery," gives the year of the report, notes the primary location or region, and cites the short-reference used in the manuscript reference list. The 25-year window specifically captures contemporary methodological regimes (e.g., targeted camera trapping, passive acoustic monitoring, eDNA, and rapid-response fieldwork) while including a small number of pre-2005 rediscoveries that materially contextualize recent trends.

Entries were selected against three explicit criteria: (a) *taxonomic novelty* (i.e., formal species descriptions or taxonomic revisions that added a recognized species), (b) *conservation significance* (i.e., rediscoveries or finds that substantially altered conservation status or management priorities), and (c) *high public or scientific attention* (i.e., cases that generated notable follow-up research or policy interest). Each included item meets at least one of these criteria: for example, *Pongo tapanuliensis* and *Bassaricyon neblina* represent clear taxonomic novelties with genomic or taxonomic reviews; *Chelonoidis phantasticus* and *Dryocelus australis* are rediscoveries with major conservation implications; and Voeltzkow's chameleon and *Megachile pluto* generated notable scientific and public attention that exemplifies how rediscovery can reshape priorities and methods.

Table 1. Notable Zoological Discoveries and Rediscoveries (2000–2025).

Species (common name)	Type	Year	Location / Region	Reference
Pongo tapanuliensis (Tapanuli orangutan)	New	2017	Sumatra, Indonesia	Nater et al. 2017
Bassaricyon neblina (Olinguito)	New	2013	Andes (Ecuador/Colombia)	Helgen et al. 2013
Boophis "Star Trek" frogs	New	2024	Madagascar	Vences et al. 2024
Crurifarcimen vagans (wandering leg sausage)	New	2011	Tanzania	Enghoff 2011
Callicebus caquetensis (purring titi monkey)	New	2010	Caquetá, Colombia	Defler et al. 2010
Voeltzkow's chameleon	Rediscovery	2020	Madagascar	Glaw et al. 2020
Megachile pluto (Wallace's giant bee)	Rediscovery	2019	Indonesia	University of Sydney 2019
Chelonoidis phantasticus (Fernandina giant tortoise)	Rediscovery	2019	Galápagos Islands, Ecuador	Jensen et al. 2022
New Guinea singing dog	Rediscovery	2016	New Guinea	Surbakti et al. 2020
Dryococelus australis (Lord Howe Island stick insect; "tree lobster")	Rediscovery	2001	Ball's Pyramid, Australia	Priddel et al. 2003

Note: Entries were selected for taxonomic novelty, conservation significance, or notable scientific/public attention; "New" denotes formal species descriptions or taxonomic revisions, "Rediscovery" denotes species thought extinct or missing from the wild and later documented.

Table 1 also reveals some broader patterns worth highlighting. Technological advances have seemingly reshaped discovery rates: the widespread adoption of camera traps, passive acoustic arrays, and eDNA since the early 2000s has increased detection of cryptic and low-density taxa and enabled faster verification of field reports. Rediscoveries tend to cluster in well-surveyed but logistically difficult refugia such as islands, isolated mountain ranges, and remote forest fragments, where species thought lost persist in small, inaccessible populations. Geographic hotspots reflect a combination of true biodiversity and uneven survey effort, with the tropical Andes, Southeast Asia, Madagascar, and island systems appearing disproportionately in notable finds because they combine high endemism with renewed targeted effort.

The taxonomic emphasis of recent discoveries has broadened: although high-profile vertebrate finds still attract attention, many important additions are in invertebrates, amphibians, and small mammals that require specialized methods and taxonomic expertise. Rediscoveries frequently follow focused searches by small teams or knowledgeable amateurs whose local familiarity and persistence complement institutional science, pointing to the value of ethical amateur–professional collaboration. Media attention and conservation urgency interact in complex ways; high-profile rediscoveries can rapidly mobilize funding and protection but can also distort priorities when not tied to robust conservation assessments.

Data quality and verification remain limiting factors for interpreting reports, since increases in low-quality footage and potential digital manipulation heighten the need for forensic validation, independent replication, and standardized reporting protocols. Taken together, these patterns indicate that recent trends are driven as much by changes in tools and effort as by residual biological surprises, and that methodological rigor, targeted effort, and ethical partnership are central to converting anomalous reports into verifiable biological and conservation knowledge. These empirical patterns clarify why specific methodological guardrails (e.g., formal definitions and plausibility estimates) and collaborative practices are now critical.

To be sure, witness narratives often reveal how perceptual biases, memory reconstruction, prior belief, and collective storytelling can shape anomalous experiences (e.g., Ironside & Wooffitt, 2021). Standardized interviews, situational reconstructions, and preregistered experiments can translate testimony into testable hypotheses about attention, pattern detection, or rumor dynamics (e.g., Houran et al., 2025). Anthropologists, folklorists, and media scholars can trace how landscape, local history, economic anxieties, and digital platforms influence which creatures are seen, and how evidence is curated, contested, and circulated (e.g., Baynham-Herd, 2020; Daly, 2023; Nickell, 2011; Paxton et al., 2025; Thadani, 2023). These insights underscore how publics evaluate extraordinary claims and how institutions might better engage communities whose experiences fall outside disciplinary frames.

Note that even the most concrete forms of evidence such as sworn testimonials and photographic data often

occupy a liminal space between empirical artifact and folkloric symbol, where competing interpretations blur the boundary between documentation and myth. For example, the "Patterson-Gimlin film," a 1967 short motion picture shot at Bluff Creek that purportedly shows a large bipedal hominoid (i.e., sasquatch), has been subjected to decades of forensic, biomechanical, and testimonial analysis and counterclaims. Nickell (2011, 2020) and other skeptics argue it was a costumed hoax as supported by a popularized confession by Bob Heironimus, aka "the man in the suit" (Long, 2004), whereas specialists contend the subject's gait and proportions resist easy mimicry (Krantz, 1992; Meldrum, 2006) and that Heironimus' confession has dubious aspects (Green, n.d.). Likewise, the "Surgeon's Photograph"—long promoted as iconic visual evidence for a large plesiosaur-like creature in Loch Ness—was apparently exposed in mainstream accounts after a 1994 confession alleged that it was staged. Yet, that confession and the wider hoax narrative have been challenged by investigators who question the documentary record and the motives of the key witnesses (for a discussion, see Bauer, 2002, pp. 238–239).

But despite centuries of exploration, our oceans—and other vast, remote regions like mountain ranges, rainforest basins, and deep lakes—continue to constitute Earth's final frontiers with the capacity for biological surprises at the macro-scale. For instance, *Chirodectes maculatus*, a rare spotted box jellyfish, is a marine enigma seen only twice, first in 1997 off Queensland, Australia, and again in 2021 near Papua New Guinea where it was filmed in the wild (Roscoe, 2022). Its extremely elusive nature makes any sighting a historic event. Researchers also recently identified a new species of lanternshark (*Etmopterus westraliensis*), a slender, black bioluminescent shark found at depths of up to 610 meters. With glowing photophores on its belly and sides, the 40-centimeters-long predator joins two other new shark species previously identified from recent expeditions (Ng et al., 2025). There are compelling reasons to expect other disruptive discoveries ahead. Deep-sea expeditions routinely uncover new species, and the longest known animal was only recently identified (Irving, 2020). Research also supports "Cope's rule" in marine life, suggesting that animal lineages tend to evolve toward larger body sizes over time (Heim et al., 2015). But, the pace of discovery is hindered by an average 21-year lag between finding and formally describing new species—delays shaped by biological, social, and geopolitical biases (Fontaine et al., 2012).

Drawing from the World Register of Marine Species (WoRMS), Appeltans et al. (2012) specifically estimated that hundreds of thousands of marine species remain undocumented, with new macro-species continuing to emerge. UNESCO (2012) echoed this optimism, proclaiming a new "marine Age of Discovery" driven by technological breakthroughs that grant access to previously unreachable habitats. However, this hopeful outlook—at least regarding the discovery of large marine animals—is tempered by more conservative projections that constrain the likelihood of finding new large species, especially when viewed through a Bayesian lens that accounts for prior probabilities. For example, Woodley et al. (2008) estimated that only up to three pinniped species (i.e., aquatic mammals with flipper-like limbs)—seals, sea lions, or walruses—may remain undiscovered, based on historical patterns of species description and statistical modeling.

INSTITUTIONAL, ETHICAL, AND RESEARCH IMPERATIVES

Charles Darwin's (1859, 1868) practice of treating anomalous natural-history reports and so-called "monstrosities" as evidence about variation and species limits offers a valuable historical precedent about collecting diverse evidence, weighing naturalistic observation alongside documentary reports, and remaining open to theory revision remain sound methodological principles. The modern study of cryptid reports likewise encourages integrative protocols that few research areas routinely practice. Mixed methods combining ecological fieldwork, cognitive testing, ethnography, acoustic and visual analytics, and community-based participatory research can yield falsifiable findings while reducing adversarial dynamics between claimants and skeptics.

Following this idea that natural-history reports can highlight variation, anecdotal accounts and local oral traditions indeed suggest that well-known species may attain extraordinary sizes in certain ecosystems. One striking example is the Congolese legend of the "J'BaFofi," a giant spider described in both indigenous accounts and cryptozoological literature (Roy, 2024). It is said to have a leg span of up to five feet (1.5 meters), which far exceeds the largest scientifically documented spider, the Goliath birdeater (*Theraphosa blondi*), whose leg span reaches 30 centimeters (12 inches) (Foelix, 2011). Another case is the 1959 Katanga helicopter sighting, in which Colonel Remy

Van Lierde reportedly photographed an enormous snake estimated to be 40 to 50 feet (12–15 meters) long (Heuvelmans, 1978). If accurate, this would surpass the largest snake recorded in modern times—the newly discovered Northern Green Anaconda (*Eunectes akayima*), which reaches up to eight meters (26 feet) and weighs around 440 pounds (200 kilograms) (Puiu, 2024). In fact, the Katanga snake's reported size rivals that of *Titanoboa cerrejonensis*, a prehistoric giant that lived during the Paleocene Epoch (~66–56 million years ago) and stretched up to 15 meters (49 feet) in length (Head et al., 2009).

Responsible inquiry requires transparent preregistration, open data sharing with reputable investigators, independent replication of acoustic or visual anomalies, routine environmental controls for DNA sampling, and forensic validation of imagery and audio. Researchers must adopt standardized, dignity-preserving interview protocols and implement robust protections for participant privacy. A select few cryptozoological oriented studies have been published in scientific periodicals over recent years (e.g., Daly, 2023; Greenfield, 2023; Sykes et al., 2014), along with a vast array of tangential topics (Houran & Bauer, 2022). However, journals, funders, and institutional review boards should accept null results, method papers, and replication studies as valuable contributions rather than marginal or unpublishable outcomes. Investigators must also anticipate hazards such as low-quality footage, deepfakes, sensationalized reporting, privacy breaches, and incentives that could encourage dangerous behavior or wildlife exploitation.

A productive research program should begin with interdisciplinary pilot projects co-designed with local communities and naturalists to align scientific rigor with community needs. Participatory research methods—where local stakeholders assist in the selection of research questions, sampling strategies, and interpretive frames—help to ensure relevance, trust, and shared epistemic investment (Cornish, 2023; Vaughn & Jacquez, 2020). Rapid-response documentation teams with pre-agreed methodological checklists can capture high-signal events before artifacts or contamination accumulate. Indeed, the Bigfoot Field Researchers Organization (BFRO) already does this, though generally speaking this approach may require a baseline natural history to be productive. Scalable, replicable measurement tools such as passive acoustic arrays, systematic camera-trap grids, standardized interview batteries, and routine eDNA sampling at suspect sites should be prioritized. Funded meta-analytic work can synthesize case reports, map spatial clusters, and quantify methodological variation across studies. Editorial reforms and new publication venues should explicitly welcome rigorous null findings, replication efforts, and method-focused contributions. These investments will convert episodic curiosity into cumulative knowledge, increase the likelihood of genuine biological discovery, and reduce the cultural noise that obscures meaningful signals.

TREKKING TOWARD NEW INSIGHT AND KNOWLEDGE

Amateur naturalists and cryptozoologists often shoulder the burdens of long-term observation because role identity, community belonging, and perceived stewardship motivate sustained engagement (Carter & Mangum, 2022; McCall & Simmons, 1978). Stakeouts and ritualized field practices build skills in tracking, acoustics, and camera-trap work while producing narrative rewards that eclipse material costs (Cunningham, 2022; Durakiewicz, 2022). Productive science should harness this distributed observational capacity via ethically rigorous collaboration that converts grassroots investments into conservation-relevant data and empirically tractable questions about perception and biodiversity (cf. Bonney et al., 2009). Local stakeholders often care deeply about apparent anomalies that affect recreation, tourism, or perceived safety, and credible investigation can inform management responses, reveal previously unrecognized habitats, and strengthen civic trust in scientific inquiry (Houran et al., 2020; Ironside & Massie, 2020).

Cryptozoology now occupies a hybrid and controversial space between amateur natural history, folklore studies, and selective scientific engagement, as Brian Regal (2008, 2009) candidly discussed in his treatises on the inherent tensions between the competing "amateur vs. professional" sasquatch investigation groups. The field's conceptual broadening—from a narrow search for unknown animals to a spectrum that arguably includes psychological and cultural phenomena—creates interdisciplinary opportunities of real scientific and social value. Even some skeptical authorities have emphasized how many eyewitness reports may plausibly be based on some underlying physical reality, even if not representing an actual encounter with an unknown or presumably-extinct species (see e.g., Greenfield, 2023; Paxton & Shine, 2025).

When pursued with methodological humility, ethical care, and institutional protections for researchers and participants, the study of cryptid reports and associated material evidence can potentially reveal overlooked biodiversity, illuminate mechanisms of human perception and belief, and improve how science engages the public on anomalous claims. But intellectual curiosity does not imply credulity; it denotes disciplined openness. Monsters may indeed walk in our backyards or dwell in the back of our minds, but with robust tools and sober hypotheses, those monsters will do the work of revealing something important about our world and ourselves. Cryptozoology endures not as a relic of romantic speculation but as a reminder that discovery begins where imagination meets disciplined inquiry—an integrative frontier science still waiting for its next great expedition.

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Experts' Remote Viewing Guidelines

RESEARCH ARTICLE

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ABSTRACT

A survey of renowned experts in remote viewing was conducted to gather their opinions on recommended procedures and conditions for obtaining the best results with real-time remote viewing and precognition tasks. Eleven experts responded. Findings revealed both areas of consensus and notable divergences. Experts generally agreed that structured training, such as Controlled Remote Viewing (CRV), produces more reliable results. They emphasized the necessity of maintaining a neutral, distraction-free environment, with some highlighting the role of meditation and mental discipline in enhancing accuracy. Respondents recommended that participants have at least one year of experience in remote viewing protocols. Some suggested practicing meditation before the task and allowing participants ample time, as defined by the viewer themselves, to complete their sessions, which can be conducted solo or in small groups. Experts also agreed on the importance of blinding procedures to prevent contamination of results and the value of using multiple independent viewers in operational applications. However, differences emerged regarding the flexibility of remote viewing methodologies. Some experts advocated for strict adherence to structured protocols, while others argued that individual talent and self-developed techniques could be equally effective. Opinions also varied on the role of viewer feedback, with some emphasizing its necessity for skill improvement while others warned of potential displacement effects. Overall, this expert-driven analysis highlights critical methodological considerations for optimizing remote viewing performance. While fundamental principles such as training, environmental control, and blinding are widely accepted, further research is needed to empirically compare the effectiveness of differing methodologies. These findings offer a provisional framework for future studies and operational remote viewing project management.

KEYWORDS

Remote viewing, extrasensory perception, meta-analysis, expert consensus, methodology.

Remote viewing is a unique perceptual discipline used to acquire information beyond the reach of ordinary physical senses. Remote Viewing has been defined as, "the ability of a person to access and describe, by mental means alone, information blocked from ordinary perception by distance, shielding, or time" (Utts, 1996, p. 3).

It gained notable attention during the Cold War when so-called "psychic spies" employed it for classified military operations. Remote viewing has a rich history, not only

as an intelligence-gathering tool but also as the subject of research and practical applications in the civilian sector (International Remote Viewing Association [IRVA], n.d.).

A recent meta-analysis by Tressoldi and Katz (2023) examined remote viewing experiments conducted over 50 years, finding that protocols for remote viewing experiments yielded stronger results than other extrasensory perception methods. In recent years, remote viewing has experienced a resurgence in popularity, finding applications across diverse fields such as intelligence, medicine, business, science, financial forecasting. A survey by Katz and Tressoldi (2022) highlights this trend, noting that practitioners are increasingly engaging in projects like crime solving, locating missing objects, and financial forecasting.

One prominent methodology employed for predicting future events, including stock market fluctuations, horse racing outcomes, football games, and presidential elections, is *Associative Remote Viewing* (ARV). ARV involves associating potential outcomes of an event with unrelated stimuli—commonly photographs or video clips, but sometimes even tastes or smells—to expand the range of target choices. Remote viewers are then tasked with describing the feedback they will receive after the event, which corresponds solely to the actualized outcome (Katz & Knowles, 2021). For instance, Smith et al. (2014) conducted an ARV experiment where ten inexperienced remote viewers attempted to predict the direction of the Dow Jones Industrial Average (DJIA). For each trial, one image was paired with a downward movement of the DJIA, and another with an upward movement. Each participant did a remote viewing session, and an independent judge made a prediction and wager on which direction the DJIA would take. The study reported a 100% success rate over seven trials, leading to significant financial gains. Similarly, Katz et al. (2017) employed ARV to predict the outcome of the 2016 U.S. Presidential Election. In this double-blind study, 41 experienced remote viewers described feedback photos linked to potential election outcomes. The results indicated significant differences in descriptions, suggesting that while the viewers did not always describe the photo they were shown, they often tuned into photos associated with other outcomes, raising questions about the reliability of large group consensus approaches in ARV projects.

These examples underscore the growing interest and application of remote viewing techniques, particularly ARV, in practical domains. However, they also highlight the need for further research to understand the variables influencing the success and reliability of Associative remote viewing methodology. As extensively outlined in Tressoldi and Katz's (2023) systematic review, ARV is only one of many remote viewing designs. Remote Viewing encompasses a wide range of procedures for a wide range of purposes. These include methods for detecting extrasensory information from personal mental content, techniques for assisting remote viewers, and strategies for evaluating extrasensory information to identify the target. Unfortunately, the limited number of experimental studies available prevented direct comparisons among these various procedures.

The meta-analysis by Tressoldi and Katz (2023) thus provides a quantitative update of currently available experimental results, and further research is required to enable experimentally verified comparisons of approaches. While waiting for enough studies to enable such comparisons, we propose that the insights of respected experts in the field of remote viewing could offer a valuable and provisional alternative. In the future, it should be possible to relate expert views to experimental data, and such comparison will be most valuable. However, the purpose of the current study is not to validate or challenge expert perspectives using experimental findings but to explore the landscape of expert thought in the field of remote viewing. Our goal is to map the range of perspectives and highlight areas of convergence and divergence. This is a foundational step in qualitative inquiry, especially in disciplines where empirical data is limited, inconsistent, or under-theorized. As qualitative scholars such as Lincoln and Guba (1985) and Creswell and Poth (2018) have emphasized, the value of expert perspectives lies in their capacity to generate hypotheses, guide research agendas, and provide experiential insights that are often missing from strictly empirical studies. While integration with experimental literature is a worthwhile direction for future mixed-methods or quantitative follow-ups, it is beyond the scope of this initial exploratory study. Even if there are many books on how to use RV (e.g., Katz & Knowles, 2021; McMoneagle, 2013; Moorehouse, 2007; Smith, 2014, 2015; Targ, 2004), as far as we know, this is the first semi-structured interview to a pool of renown experts.

METHODS

Twenty-four renowned experts in remote viewing, selected by their contribution to the study and the application of such techniques, were invited to participate in an online survey.

To mitigate the possibility of choosing experts simply because of their name recognition, popularity, or self-promotional abilities, we employed the following criteria for selecting experts: They needed to have overseen numerous remote viewing projects over a period of at least 5 years (although most had more than 10 years of experience managing RV projects). They had to have published their methods and results in either peer reviewed journals, professional industry magazines, or scholarly books and to have discussed their work at conferences and in video interviews. They were preselected through a process of snowball sampling and known to the researchers to have worked with many participants over time and across multiple projects. These remote viewing projects could be of an experimental nature or an applied nature but ones using careful scientific protocols such as blinding procedures, separation of roles, and randomization techniques.

The instructions were as follows: "According to your expertise in remote viewing, what are the best procedures and conditions for obtaining the best results with clairvoyance (defined here as present-time intuitive functioning) and precognition (defined as future-based) tasks?" After a response example, they were requested to write their recommendations related to participants' characteristics, the environment where the remote viewing task will take place, and overall procedures and design considerations.

To analyze the survey data, we employed thematic analysis within the methodological framework of grounded theory, as articulated by Braun and Clarke (2006). This approach facilitated the systematic and inductive identification of salient patterns, themes, and concepts emerging from the dataset. Grounded theory provided a flexible yet rigorous framework, enabling the development of insights grounded in the participants' narratives rather than shaped by a priori assumptions. Thematic analysis was carefully applied to ensure that the resulting themes were both credible and richly reflective of participants' lived experiences. This methodology is widely recognized for its capacity to generate in-depth qualitative insights while maintaining high standards of analytical rigor (Charmaz, 2006; Strauss & Corbin, 1990).

RESULTS

Respondents

Eleven experts (45.8%) responded to our invitation. Eight filled in the survey, and the remaining three sent their recommendations by email. Their names are as follows in alphabetical order: Tom Atwater, Gail Husick, J.D., Jon Knowles, Debra Lynne Katz, Ph.D., Joe McMoneagle, Julia Mossbridge, Ph.D., Maximilian Műeller, Ph.D., Erich Schöne, Stephan Schwartz, Daz Smith, and Angela Thompson-Smith, Ph.D. Since the authors believe that it is important to allow readers to know whose expertise is drawn upon for purposes of credibility and for purposes of acknowledging the experts' contributions to remote viewing, these individuals' consent to have their names used in this paper was requested and received.

Additionally, we had in our possession an original, unpublished document written by Ingo Swann, who coined the term "remote viewing" with other researchers at the ASPR in the early 1970s (Swann, 1993a). Swann would go on to work as a contract viewer and researcher at Stanford Research Institute from 1972 to the mid-1980s, at which point he obtained a governmental contract to develop and train other personnel in *Controlled Remote Methodology* (Katz, 2021). In this document, Swann (1993b) addressed similar questions as those presented in our survey, so we took the liberty of incorporating his responses from this document into our survey.

All experts have experience managing remote viewing projects for both applied and operational projects. Nine of the 11 are expert or professional-level remote viewers themselves. Ten out of 11 have over 10 years of remote viewing experience, with half having at least 20 years of experience. Ten have published experimental write-ups in industry magazines or books, and six have published in formal journals. All have also served as research participants themselves.

Preliminary Statements by Respondents

Several experts offered overall thoughts that were relevant to this study. Daz Smith stated, "In all honesty, it comes down to individual talent, not procedure, environment, or any other ritual." Conversely, Katz placed more emphasis on the importance of sound procedures, asserting:

> If you are going to do it, do it right. If at any point you have the thought that something isn't ideal but that it's just the way it has been done before or that it's all you have time, energy, or money for—then stop right there, abandon that

> thought, and if you can't do that, then you might as well give up the idea of doing the project at all. There are enough studies out there with mediocre results due to this type of attitude.

Joe McMoneagle stated:

> More important than any other thing one could speak to in remote viewing is—there are only two protocols for remote viewing projects. Both were written at SRI International in the beginning of the 1970s; one is straight up for just remote viewing, and that is a remote viewing protocol. The other protocol is for ARV, or Associative Remote Viewing protocol, that is only used to address binary, forced-choice questions, like Yes/No, Buy or Do Not Buy, etc.

Jon Knowles said:

> I feel the absence of experience by researchers in doing remote viewing has led to more than a few bad experiences by viewers and leads to research that is out of touch with what's been learned by viewers and project managers over the last 28 years. Julia Mossbridge, Ph.D., is a rare model of combining both skills. It does appear that (in regular RV) targets/projects that have a distinct personal, group, or other 'real world' meaning get better results. Parapsychological researchers are at a disadvantage, in my opinion.

A few experts stated their experience centered more so on managing applied or operational projects rather than formal research projects. Atwater said, "I don't really do clairvoyant tasks much, except as training exercises in classes and such," and Husick stated, "My responses in this questionnaire relate to the type of operational client projects done at the Husick Group, LLC, and may or may not be applicable to other contexts."

Remote Viewing Participants' Characteristics

Training and Experience

Experts such as Daz Smith, Husick, Knowles, Müller, and Swann stressed the importance of using viewers with training and experience. Some expressed this preference in general terms: "experienced viewers with a good track record" (Knowles), "the highest possible number of practice hours or practice sessions" (Müller). Others were more specific: "trained through the advanced level" (Husick), "people with at least a year's experience in remote viewing" (Daz Smith).

One expert also suggested that the viewers' training should include the ability "to write a full session and summary—clearly" (Daz Smith).

It was also suggested that the viewers' experience needs to be current: "Participating viewers should be maintaining their skills on a current basis through regular practice and project participation," said Husick. Current experience may also involve a rotation of assignment types. She added:

> Ideally, viewers should be given a variety of assignment types over time. A steady diet of a particular type of target (only missing person cases, only near-future event targets, only business-enterprise projects, etc.) can create its own form of pollution, even if a viewer is technically blind to a specific target.

Swann wrote:

> The problem involved here is the signal-to-noise ratio, and extensive experimentation through the years and in several laboratories showed that the signal ratio in untrained viewers was only 20 percent or less at best, while it can be elevated to 75 percent or more via training.... Only trained viewers are tutored to discriminate between the 'overlays' of their imaginative processes and the more important 'signals' incoming via less-noise-cluttered subliminal or pre-conscious processes (Swann, 1993b, p. 3).

Viewer Methodology

Some experts did not express a preference that the viewers use a particular methodology: "Viewers will use their own methods, cooldown as they prefer, etc." (Knowles), while others expressed the opposite opinion. Husick wrote:

> Ideally, participating remote viewers are trained through the advanced level in a structured methodology.... At the Husick Group LLC, the methodology used is Controlled Remote Viewing (CRV). I have also seen good results from groups using other structured

> methodologies, such as HRVG [Hawaii Remote Viewers' Guild]. Natural psychics working outside of a structured methodology may also produce good results, although it may be more difficult to communicate assignments to them using the vocabulary and tools available in a structured methodology, and it may be more difficult for an analyst to glean as much data from their work as compared to the work of someone using the structured methodology with which the analyst is familiar.

Müller agreed, stating, "The viewers should be trained in a structured method such as the CRV protocol, whose inherent structure can generate easily evaluable data."

Personal Characteristics

Multiple experts mentioned personal characteristics of successful remote viewers (Thompson-Smith, Atwater, Knowles, Mossbridge, Müller, and Schöne). The broadest perspective was provided by Atwater ("Anyone can do this"), but he also stressed, "An open mind is essential. Someone who truly believes that clairvoyance is real will get better results."

Several experts spoke in terms of the viewer's ability to distinguish between different mental states, such as "the ability to see past the stream of thought" (Schöne). Müller wrote:

> The most important criterion here is the viewer's awareness of his or her own mental processes. The viewer must be able to differentiate target information from mental noise and know himself well to be able to clearly report how mental images are constructed and how he interprets them.

Others spoke in terms of the cognitive/emotional styles of the viewers, saying that they should be "calm and relaxed, even in emergency tasking. 'In the Zone'" (Thompson-Smith) or "more focused on events, objects, and processes than people. Less empathic, more structured" (Mossbridge). One expert noted the level of enthusiasm the viewers have for the task: "Prefer viewers who are keen on doing the project or target" (Knowles).

Schöne stated that ideal viewers should be able to produce "deep meditative states of contemplation on demand." Schwartz wrote, "Of all the things that you can do to make yourself a better remote viewer, nothing will serve you as well as developing the practice of meditation" (Schwartz, n.d., p. 76). Müller pointed out difficulties that could affect results:

> Variables that are dependent on fluctuations such as health, mood, and motivation should be as neutral as possible. Minor deviations from a neutral state are not detrimental to the validity of a session. If major deviations such as mental health problems are identified before a session, these must be resolved beforehand or at least put aside for the session in order to guarantee a valid attempt. Viewers should always be blind to the specific target.

Relationship to Analyst

Some experts also focused on the need for the project manager to have knowledge of the viewers. Knowles stated, "It is best if the viewer's session characteristics are known to the project manager or analyst." Husick wrote, "Familiarity with a participating viewer's previous work will aid the analyst in interpreting results, as will information regarding the viewer's track record of accuracy and areas of strengths/weaknesses." Husick suggested that it is beneficial if "the analyst is trained and experienced in the same methodology as the one being used by the viewers."

Recruiting Viewers

Finally, some thoughts were offered on the recruiting of viewers. Katz stated, "Remote viewing is a skill. Unless you wish to test brand new participants for a particular reason, there is no reason to not use experienced viewers." She continues:

> If you wish to have experienced viewers, recruit from remote viewing organizations and social media platforms. If you put out a general call for remote viewers, don't leave it up to potential participants to understand what remote viewing is, but make sure you provide a definition and then create an initial set of qualifying questions to ensure they truly are experienced in remote viewing.

She also warned:

> There will be some who affirmatively respond to 'Do you have remote viewing experience?' Some mean that during their lives they have had spontaneous visions of distant places or objects or people. Some may be intuitive in

> other areas, such as mediumship or dowsing. Therefore, they should be asked specifically if they have done remote viewing of physical objects and locations or photographs and have recorded these through sketching and writing procedures.

She continued:

> In order to determine if the participants meet the criteria you are seeking, have them complete a survey.... In addition to polling them on the above-mentioned characteristics, it is suggested you ask them to explain the methods they have been trained in, the methods they use now (don't assume they are the same), and possibly the instructors they have learned from. This data could be valuable for both ensuring they are qualified for the study and for future evaluation.

Husick stated:

> The pool of viewers considered for participation in a project consists of individuals who were recommended to the Husick Group by their RV trainer or other trusted person in the RV community who is familiar with their work and who have worked on enough practice targets with me that their skill level is known to me.

The Remote Viewing Environment

Some experts, such as Daz Smith, Husick, and Knowles, believe that remote viewing can take place anywhere and that the environment doesn't really matter. One proposed that no specific environment would be needed since "anywhere should be OK to remote view" (Daz Smith). Others thought the decision was best left up to the viewers based on their experience. "Experienced viewers know how they work best, so I leave decisions about when and where to do a session to the individual viewer" (Husick). "It is up to what good, experienced viewers wish to use. Generally, this involves a meditative cooldown, often with hemi-synch type soundtracks and a quiet place to do the session" (Knowles).

Many experts focused on the benefits of quiet and non-distracting environments (Thompson-Smith, Atwater, Mossbridge, Müller, Schöne, and Schwartz). "The environment should be spare, without much stimulation in any sensory modality" (Mossbridge). Specific suggestions included: "Turn off the phone. Have all supplies ready before starting" (Thompson-Smith). Müller stated:

> An experimental setting in a low-stimulus, neutral environment should be provided. If there is an experimenter or other people in the room, they should fade into the background so that a viewer can fully concentrate on his session. In general, there should be no external distractions, such as a smartphone, during a session. This can best be checked in the laboratory.

Schwartz suggested that the environment should be "a place which is not too visually busy, nor one that has noticeable odors or recurring sounds" (p. 68).

It also was suggested that certain specific features of the environment may be helpful if they are meaningful to the viewer: "Image fixations such as candles, fire, darkening, ritual actions, or ritual objects to which a meaning is attributed for the enabler of powers seem helpful. For example, placing attention in a round glass ball" (Schöne).

While Swann didn't mention the environment in the document we examined for this project, it should be noted he wrote several memos detailing his vision for an ideal environment for remote viewers that included a sparse, bland, clean environment, neutral colors, and being free from all distractions, including material and human. His instructions were closely followed in the designing of the offices located at Fort Meade Army Base, where the remote viewers, including his students, would go on to do their remote viewing sessions for numerous military and governmental law enforcement agencies (Ingo Swann Research Fellowship, n.d.; Smith, 2005).

Remote Viewing Procedure

When it comes to the procedure to be used in a remote viewing tasking, Schwartz stated, "Keep the experiment logistics as simple as possible, involving the fewest number of people to accomplish all the required tasks" (p. 166).

Another expert commented that "participants ought to be surrounded by compassion and love during the process" (Mossbridge). Similarly, Katz stated,

> Participants prefer to work with a researcher that is competent, friendly, helpful, relaxed, encouraging, and warm as opposed to one that is skeptical, uncaring, hurried, stressed, or

> grumpy. However, in remote viewing studies, there is of course the intuitive aspect. Viewers both tend to have thinner boundaries, so they may be particularly sensitive to a skeptical, angry researcher.... It is not only imperative this applies to the researchers involved, especially those interfacing with the viewers, but I'd go as far as to say everyone in the project should be ones who have a balanced but positive attitude and expectation for the outcome. Also, they should at all times be honest with the viewer. If something has gone wrong with a trial, they should let the viewer know this. This is because viewers are not only intuitive during the session, but also throughout the entire process. If a researcher is hiding something from them, they may not know the details, but subconsciously the viewer will pick this up and start to feel and exhibit distress.

Multiple Viewers

Several experts mentioned benefits in the use of multiple viewers in a project (Daz Smith, Husick, Katz, Knowles, Müller, Schwartz, Swann). It was felt that the use of multiple viewers also "helps with consensus data" (Daz Smith), and it was said that "the more viewers independently work on the same target, the higher the density of available information" (Müller).

One expert specifically recommended a "team of 3 to 5 viewers" (Knowles). Another spoke in larger terms: "Overall, in a project, several teams consisting of viewers and monitors should generate data, all of which come together under one project manager" (Müller). Schwartz stated, "Have multiple viewers each working with their own target set and look for consensus" (p. 161).

One expert stressed special precautions to be taken when using several viewers: "Where multiple viewers are working on the same project, they work independently of each other and are not informed of the identities of the other viewer participants while the viewing phase of the project is underway" (Husick). This would help facilitate blinding (see below).

Swann stated:

> In the professional sense, the data yields of a remote viewing attempt must come from two or more viewers, not essentially to arrive at a consensus of them, but in that different viewers provide different kinds of data or different emphases of them. Where the combined data of a number of viewers agree is important, but where the data disagree may be equally important. (Swann, 1993b, p. 3)

Target Selection/Definition

A key part of a project is the selection and definition of the target. How this is done varies depending on whether the project is operational or non-operational.

Non-Operational Targets

When it comes to non-operational targets, Mossbridge recommended:

> The target should be selected in an empty room where a computer runs software randomly selecting a target and displaying it (whether video or photo—if video, sound is turned off). The information about which target is selected is recorded during the time of target selection, but this computer has no Bluetooth or Wi-Fi access at the time of target selection, and no one is in the room to see the target.

Another stated, "Overall, viewers often do tend to do well [on targets] that have distinct colors, movement, numinosity, entropy, action, and distinctive shapes" (Katz). She added:

> If there is something confusing or unrecognizable about a photo when looking at it with your eyes open, then viewers will likely have a hard time as well. Alternatively, if you wish to only have a 2-D image that is fine but then use a drawing, and let the viewers know in advance this will not be present in real space, only on paper or conceptual.

On the use of video targets, Katz stated:

> Videos can consist of images from real-life locations and objects (3-D), or they can be animated and artificially constructed (2-D). They should be just a short clip, not too broad, and if they are found online, such as on YouTube, they should not ever contain any ads (ads change every time a video is replayed). Video clips can be silent or include sound or music to add more potential features for viewers to perceive and describe.

Operational Targets

When it comes to an operational target, one expert stated, "The project manager crafts and documents the target definition in consultation with the client" (Husick). She further recommended that

> To the extent possible, the target is defined in such a way that there is one, and only one, correct answer. For instance, where the target is the location of a missing person, the target definition should include not only the name of the missing person but also a specific date and time. By narrowing the target definition in this way, meaningful patterns are more likely to emerge from the work of multiple viewers, as compared to a situation where each viewer may be describing where the missing person is at a different date and time than the other viewers.

Husick also stressed that

> The target definition should be free of unverified assumptions. For instance, 'the person who abducted missing person Suzy Q. Smith' would not be a valid target definition if there is any possibility that Suzy Q. Smith left voluntarily or met some fate other than abduction. In such a case, 'the circumstances resulting in the disappearance of Suzy Q. Smith' would be a better target definition.

Schwartz commented that, in research, "viewers seemed to be particularly good at describing targets when some kind of energetic change was taking place" (p. 102). "So, to give yourself the highest probability of success, pick from a sufficiently numinous target pool, a set of targets that are very orthogonally distinct, of equal entropy and numinosity" (p. 133). He also stated, "In nonlocal awareness, high emotional intensity is the key" (p. 197).

Target Sequencing

Katz called attention to the issue of the sequence in which targets are presented to viewers. She stated:

> The remote viewing community is a small one; even if you keep all viewers apart, they may end up discussing their targets. This means that they might inadvertently expose the wrong target to each other as viewer feedback, which could lead to displacement, or it could give a clue to the viewer about a future target they might receive. Also, it's going to be much more time-consuming for a judge to have to look at one photo, judge it against one session, then look at another photo, and judge it against another. There is also some informal data suggesting the effect of viewers all having the same photo at the same time can strengthen the effect. The key is that all viewers have to turn in their session work before even one can receive feedback, since again they could easily communicate. Processing too many different photos and transcripts per trial can be confusing, especially if the judge is assigned to more than one viewer. So because it can get really chaotic, and due to the power of the intuitive effect of everyone getting the same photo at the same time, I'm in favor of this—as long as no one gets feedback till everyone is done.

Katz also acknowledged that some parapsychologists who serve as referees for papers express concern about *the stacking effect* (Thouless & Brier, 1970) which was a concept more relevant to forced-choice experiments involving multiple back-to-back trials. She has found that using wording in write-ups that demonstrate the authors who first introduced the concept of the stacking effect later would go on to say a project should not be disqualified for giving all viewers the same targets in the same order (provided the above careful procedures to ensure blindness are followed). When this wording is included in a journal submission, most referees don't reject the paper in the way those do when this wording is not included.

Remote Viewing Protocol

When it comes to the selection of RV protocol, one expert said that it should be left up to the viewers: "The information-reception portion of the procedure should be up to each participant—they should use whatever means they want to attempt to predict a target that is simultaneously randomly selected" (Mossbridge). Similarly, Katz stated,

> Don't dictate the methods an experienced viewer uses to perform their intuitive work but rather let them use the methods they are most comfortable with. That being said, there could be some exceptions to this. First of all, you might be researching a particular method, so then you are going to want all viewers to use a

> similar one. Or, you might need them to provide less pages to accommodate the needs of judges and analysts, and in this case, they could be told to do their session as they normally would but then to put it into a shorter summary with words and sketches consolidated. This is sometimes difficult for more prolific viewers initially, but I've seen them adjust quite well.

Other experts stated that it depended on the nature of the tasking (Thompson-Smith, Müller). For example, "When it comes to binary decisions, the ARV protocol can be used" (Müller).

These experts felt that, once a protocol was selected, it was important that viewers "follow protocol" (Thompson-Smith) and that "to reduce ambivalence, all participants should use the same method, e.g., the CRV protocol" (Müller).

Communications with Viewer

An important issue is the way in which project managers communicate with the viewers. This happens at different stages of the overall project.

For communications before the viewers undertake their sessions, one expert stated that "the procedure should be clear—whether it takes a video and written instructions, each participant should be well informed of the procedure and have their questions answered before attempting the task" (Mossbridge).

Another expert said that "when given their assignments, viewers are not told the target definition but are given coordinates, [any potential] frontloading, and a due date" (Husick). She continues:

> The due date is for practical reasons, and I have seen no evidence that a longer due date results in better session work. Depending on the nature of the target and the needs of the client, additional requirements may be communicated with the assignment, such as a sketch of a map of a target location or the production of a timeline of a target event or sequence of events. To avoid pollution, no other information is provided to the viewer at this stage.... Similarly, it should be made clear to the viewers that accuracy is the goal. Even subtle pressure to provide a particular answer, to please the client, to confirm the expectations of the analyst or project manager, or to produce sensationalistic results can be polluting.

For communications during the data collection phase, Husick stated:

> During the viewing phase of a project, all communication with the viewer is kept as neutral as possible to avoid even inadvertently leaking information that might pollute the viewer and trigger his or her imagination or analytical thought processes. For this reason, communication via e-mail is preferred to audio or visual contact. Additionally, even seemingly innocuous phrases such as 'good job' are avoided. Praise or criticism may be offered for procedural aspects of the project only (for instance, working in structure, providing a well-organized session summary, including sketches, meeting a deadline), and no comment is made on the substance of the session work.

Husick also stated:

> I would also note that trust between the viewers and the project manager/analyst is important to obtaining good results. Because viewers work blind to the target, they must rely on the project manager to conduct the due diligence necessary to vet the client and the target, and they must rely on the project manager to refrain from assigning tasks that conflict with a viewer's values. Worries about whether they are being asked to violate someone's privacy, aid in an illegal or immoral endeavor, or otherwise participate in something they would object to if they knew the details can be distracting to viewers. Viewers are also dependent on the project manager to craft a valid target definition that doesn't send the viewers off on a wild goose chase or otherwise waste their time. Viewers are dependent on the analyst working professionally and not twisting or filtering the viewers' work to fit the analyst's biases. Viewers need to feel secure that their identities will not be disclosed to the client or others without their permission. To obtain accurate results, it is important that viewers record all of their perceptions, no matter how seemingly bizarre, nonsensical, or even embarrassing. Viewers are less likely to self-censor if they are confident that their work will be received and considered with respect and that they will not later be subjected to ridicule or embarrassment for something they have reported.

Blinding and Frontloading

Several experts discussed the issue of the blinding and frontloading of viewers (Husick, Katz, Knowles, and McMoneagle).

Katz stated:

> Blinding will need to be defined. At the very least, the viewer and the researcher who has contact with the viewer should be blind to the entire target pool. Whoever creates the pool should be blind to the order of the targets assigned to each viewer. Judges and analysts should be blind to targets until the remote viewers have completed each trial.

Knowles stated that he prefers "viewers be completely blind to the target—told only the TRN/tag." However, he also said, "For some operational work, minimal frontloading is okay or even necessary."

Husick stated that

> Frontloading is optional, and when used, it is neutrally worded and indicates which aspects of the target the viewer should devote his or her time and energy to (for instance, 'the target is an event' or 'the target is a person' or 'the target is a location')." She also stated, "To avoid the creation of a speculative feedback loop, information about the project (identity of client, target definition, etc.) is not provided to viewers until after actual [operational] feedback is available. For the same reason, viewers are not to discuss the target or share their sessions with each other until after actual [viewer] feedback has been provided.

On the other hand, McMoneagle stated that both RV and ARV protocols

> dictate that all participants are totally blind to what's being asked or targeted, and this includes anyone else present who must (also by protocol) be blind to the target as well. In training, as an example, all those trained by Ingo [Swann] have broken this protocol since Ingo always knew the target while teaching RV. They learned to read their trainer for sure but were unable to know much about the target. This is very easy to see, especially when the judge is also blind, or in the case of ARV, the [Figure of Merit, see "Judging," below] is applied to determine the quality of ARV accuracy prior to investment.

McMoneagle also stated:

> How could anyone know they are good at remote viewing if the target is known by them or anyone close to them within the process? I've done more than 50 (fifty) real-time demonstrations of RV live on prime-time television in seven countries, which were not only excellent but really stunned the program directors and audiences. But to this day, no one else has done a single good example of an RV within an acceptable protocol on film in front of 29 million viewers or more. In my humble opinion, if someone trains on completely unknown targets, then drawing what might be called an unknown target should be pretty easy for them if they were trained right.

Katz added:

> [Edwin] May et al. published a paper [May et al., 1994] in which they described how viewers will do better if they have some idea of how simple or complex a target will be and what type of category they are dealing with. It's therefore best to keep the target pool more homogenous.

> Most trained viewers will totally do terrible in a research project if you give them a 2-D object one week and the next a real location and the next a person and the next a cartoon. They don't know what approaches to use, and if you want to anger a viewer real fast, have them do a CRV session where they are exploring a target for an hour expecting a real location and doing movement commands and then they find out you gave them a drawing of a shoe.

Blinding also applies to researchers and judges. Katz stated:

> A method will need to be used to disguise the viewers' true identity from judges, when possible, to remove the possibility of favoritism, and to protect their anonymity per ethical regulations for working with human subjects. Assigning them code names or numbers will help with this.

Katz also stated, "Remote viewers today usually prefer to work alone, from home. They can scan their pages, upload, and email their sessions to their project manager."

Session Advice

Several experts gave advice to be given to the viewers on how to perform their sessions during data collection (Thompson-Smith, Atwater, Schwartz). Thompson-Smith stated, "Have no investment in the outcome. Access data, record it by writing, and stay focused."

Atwater said:

> Set your intent to do the tasking, repeating to yourself the words of the tasker—the Task. Take three deep breaths to start the session. When images come up related to anything you have recently experienced, or you sense these may be your logical self, trying to get info about the tasking—ignore them. When something totally illogical or surprising pops into your mind, record that immediately. Then go back to saying 'the Task' in your mind again. Repeat until you feel that you are done.

Similarly, Schwartz stated:

> If you find yourself drifting and random thoughts begin to percolate up into your consciousness, it is time to take a short break. Just something to break the rhythm. Talk or do something else unrelated to the session. After a few moments, return to viewing. Say to yourself, or have the monitor say, 'Target.' Stop. Say 'Target' again. (p. 72)

Related to the theme of one's logical self-intruding, Schwartz stated, "Be like a radar sweeping the horizon. A radar does not think. It simply reports an impression. It imposes no cherished outcomes or limits as to what something should look like, smell like, or even whether it can exist" (p. 73). Schwartz also stated:

> Before doing a session, many viewers find it useful to meditate or at least sit quietly for a few minutes to let the normal rhythms and stimuli of the day recede" (p. 68).

He also stated, "In addition to full-color visuals, be sure to note any smells, sounds, textures, or other experiences you associate with the target.... Just let sense impressions emerge distinctly in your mind (p. 71).

Session Scheduling and Length

Several experts commented on session scheduling and length (Katz, Müller, and Schwartz). Katz stated:

> I recommend one trial per week, twice at the most. Viewers should know in advance how many [in] total they will be expected to accomplish.... Remote viewers should be allowed to take as much time as they would like to do their session. There is no reason to limit the time they have.

Katz went on to note that sometimes exceptions to this would need to be made with more trials done in a single day. For example, some projects are run by bringing groups of viewers together in person over a few days' time. In this case, they should try to have some hours in between each trial before starting another, and all efforts should be made to help them relax and have fun in between.

On the subject of session length, Schwartz stated, "This whole process should have a relaxed, informal quality to it and not take more than minutes. If you feel stressed, you're not doing it correctly—playfulness is the right frame of mind" (pp. 72-73). Müller stated, "Depending on the task and detailed requirements, it then depends on how long a session is carried out. Stage III sessions with a duration of 20-30 minutes are usually completely sufficient for proof-oriented studies to achieve good results." He went on to say:

> When it comes to generating detailed information about a target, for example, as part of an operational task, sessions up to Stage VI, and ideally with a monitor, should be carried out. Here, the qualifications of the monitor, who asks the right questions, would also determine the quality of the session results. A session duration of a maximum of 60 minutes can be aimed for continuously in order to illuminate individual target aspects in detail.

Schwartz also has advice about the time of day and geomagnetic conditions for the session to be conducted: "So if you want to maximize the chance that your remote viewing session will succeed, you should do it 30 minutes either side of 1350 [local sidereal time] when the geomagnetic field is weak and quiet" (p. 96).

Reporting

Several experts gave specific input about the types of reports that should be required (Atwater, Daz Smith, and Katz). When it comes to reporting data back to the project manager, Atwater stated, "On your transcript, note the date, time, your name, and coordinate," and Daz Smith said,

"All viewing should be clearly written and supplied with a typed summary." Katz stated:

> It's entirely permissible and desirable to mandate that viewers sketch the target whenever possible, as it is often their sketches that are close matches to targets even if their words are off. Some viewers need extra encouragement or training with this. If a viewer doesn't sketch out shapes and their visuals, what will happen is the judge will have to be the one to read descriptions and try to imagine or visualize what the viewer was picturing and then judge their own mental picture. This would easily be solved if the viewer provides a sketch, no matter how elementary or imperfect it may be.

She continued:

> Ask viewers to provide [summaries and compilation sketches]. Let viewers work how they do, but ask them to sketch, provide summaries and compilations. If a viewer says they don't wish to sketch, tell them they can't participate then. Make it mandatory. Viewers should also be encouraged to summarize their work in the form of outline summaries, sketches, and compilation sketches, even if this is not something they typically do.... It's perfectly fine to invite the viewer to do a lengthy session. However, they should then be asked to go page by page through their transcripts and to take the words and put them into an Excel sheet-type summary. An alternative is to ask viewers to only submit the 10 to 20 words they think match with their top sketches.

Katz adds:

> For judging purposes, and also for future publications and presentations, it's imperative that viewers turn in transcripts or summaries that are easy to read, high resolution, and scanned properly. Don't be afraid to tell viewers they must comply.... Remember to give remote viewers explicit instructions about how to name their attached transcript files and the file types needed. Usually having their name or a code name, the target number, the date, etc., will help stay organized. Don't be afraid to tell viewers they must comply. Advise remote viewers to keep track of all their raw session work and summaries in a file on their desktops in case it's needed in the future.

Retasking

Three experts commented on the use of retasking as part of the project (Knowles, Husick, Müller). Knowles indicated this could be done "if needed" and should be "based on data in [the] viewer's session." Müller stated, "It can make sense to carry out further attempts at the same target based on the previous session results. The monitor decides this depending on the data, while the viewer remains blind to the target." Husick weighed in on this as well:

> Retasking may be provided in cases where additional information is desired. To avoid pollution, no new information is provided to the viewer, and the re-tasking instructions are keyed off of information reported by the viewer in his or her previous session work. For instance, 'On p. 7 of your initial session, you provided a sketch of a person holding an object. For your re-tasking, describe and sketch the object in more detail.' Re-tasking should be done sparingly, as each re-tasking increases the chances that a viewer's imagination will take over and interfere with accurate data collection.

Non-Viewers (Monitors, Analysts, Project Managers)

Katz stated, "Separation of roles is done for a few reasons, but it also works in concert with randomization and blinding. Remote viewing research projects often involve" (1) a researcher who creates the target pool, (2) a researcher who communicates with the viewers, (3) judges, (4) a person assigned to randomize targets (plus someone who holds a backup of the randomization key), and (5) a statistician. Communication between these parties should be minimal or non-existent while trials are running.

Schwartz stated, "A remote viewing session can be done alone or with a monitor/interviewer.... But, and this is very important, the monitor's job is only to keep you talking and in contact with the target, not to guide what you say" (p. 74). He continued:

> Monitors should practice their questions in their minds before they speak, making sure to weed out any queries that cue a particular response.... The monitor must impose no judgment on what the viewer is saying, however illogical or strange it may sound. (p. 75)

Two other experts addressed the role of project managers/analysts. Müller stated that the project manager

> must identify similarities and create an overall picture in the form of a report that describes the target on several predetermined dimensions. In the end, the best possible results arise from the quantity and quality of the data as well as the goal-dependent, further explorations of individual questions relating to the given target.

Husick stated:

> The analyst must be a trained and experienced viewer. However, to minimize the chance of telepathic overlay during viewing and the chance of bias during analysis, the analyst does not participate as a viewer on the same project where he or she is serving as the analyst.

Judging

Mossbridge addressed the subject of judging the viewers' results: "If this is operational, no judge is needed" since "the tasker will be the 'judge.'" On the other hand, "If judging is to be performed (if this is non-operational), ideally a non-comparative method should be used—like 'figure of merit,' for instance." McMoneagle stated:

> Dr. [Edwin] May and others developed a metric called Figure of Merit (FoM), which turned out to be an excellent predictor of RV quality prior to [operational] feedback. If the FoM was above 0.452 in ARV, it almost never missed producing over 200 ROI in 20 minutes in the binary option market.

Katz said that "training and testing should be done to establish rater reliability." There is also the challenge of retaining judges during lengthy projects. Katz stated, "Judges can get burned out easily and quickly, just like viewers, so it may be best to limit the number of transcripts and trials they are scoring."

If one of the goals is to develop a sense of the reliability of individual viewers, Katz suggested that "it would be ideal to have the same judge or two per trial rate all viewers' transcripts, and then for the next trial have another judge(s)."

> In some cases, viewers may provide information that cannot be judged. Katz stated: While they may then get some aspect that can't be judged, because it is outside the parameters of what is shown in the photo, they are more likely to make stronger emotional and somatic contact with a target and get more details. Since this is a critical aspect of remote viewing, it isn't something viewers should be stopped from doing. There will be more information that can't be judged, but this can be handled by having a judging category for information that just can't be assessed. You can mitigate this by telling viewers they should try to limit explorations to the confines of the photo—not go out or too far out of that scene.

Katz also noted that

> For ease of statistical calculations, the gold standard in psi experiments has been using matching tasks. This involves creating a set of photos, which includes the intended judging target and at least one other photo, although sometimes there could be as many as a dozen other photos. These photos need to be different from each other in every characteristic and of the same level of interest as each other. The more photos in the set, the less overall trials are needed to establish statistically significant results. So having two photos in a set will require more trials than if 10 photos were in a set. Once the viewer does their session, a judge chooses which is the best match out of the set. When a judge chooses the actual target as the best match, this is considered a hit.

However, she stated that due to displacement problems, "it's my recommendation that another process be used, unless there is another reason to have extra photos in the set, such as for ARV trials."

> On the subject of displacement, she mentioned that a way to mitigate it is to avoid letting viewers know there will be judging performed by use of a set of photos. The downside to this is experienced viewers may assume you are using this approach, or others might become intuitively aware there are multiple 'targets' during their session.

Feedback

Feedback comes in two forms: (1) in operational sessions, feedback that may confirm or disconfirm RV results may be present after data collection (either based on what

the client knows or what is later discovered), and (2) feedback may be provided to viewers. The first may be referred to as operational feedback and the second as viewer feedback.

Ingo Swann made remarks dealing with the role of operational feedback that is present after data collection for purposes of confirmation or disconfirmation. He stated:

> A 'viewing' (of a distant site or topic) cannot be said to have taken place until positive feedback indicates that it has taken place. This is the formal definition of professional remote viewing in that unless positive feedback is achieved, the 'viewing' must be held as occurring only in the mind or imagination of the alleged viewer.... Any other attribution will be considered by me as unethical. (Swann, 1993b, p. 3)

Concerning feedback provided to viewers, three experts addressed this subject (Husick, Mossbridge, and Müller). Husick said, "Once [operational] feedback is available, it is provided to participating viewers to the extent allowed by the client." Mossbridge stated, "Participants should be given feedback as to the usefulness of their sessions even if they cannot know the target." She also stated, "Ideally, conditions with target feedback and conditions without ought to be tested." And Müller affirmed, "Feedback should always take place after the evaluation for everyone involved so that they can reflect on their performance, but it is not necessary."

Schwartz stated, "Viewers do better when they get feedback than when they don't," "the closer the feedback is to the viewing, the better," and "don't show viewers the other targets" to prevent displacement (pp. 153-154). Katz added:

> A trial should not ever start until the [viewer] feedback is closed out with the last [one], [which] will psychologically help them to forget one target so they can be more focused on the next.... Receiving feedback in between trials therefore closes the feedback loop so they will be less likely to displace to the target in the next trial (a phenomenon referred to as "time displacement").... Feedback photos and videos should be high resolution, larger size photos, and it's helpful to ask viewers to take some action that assures they have viewed and interacted with their feedback photo. This action could include asking them to sketch it or to comment on it and send commentary back to the project manager.

Katz noted that sometimes it may not be practical to give feedback to viewers, which can cause problems if viewers assume there will be future viewer feedback and focus on it. In this case, "If they are told there is no feedback, they can modify their approach accordingly."

Ethics and Compensation

Katz focused on the compensation of viewers, which can have an impact on their morale and promote their retention in the project. She stated:

> If the researchers are being paid, then the viewers should be compensated as well when possible. If funds are very limited, it helps boost morale to send them gifts halfway through the trials, such as snacks. Also having meetings where viewers get to meet each other after the project, such as through an online party, could help boost morale.

Compensation can also be provided in the form of public acknowledgment. Katz stated:

> Psychological research ethics dictate that participants should be anonymous, and their data protected.... Some remote viewers are just fine with anonymity. However, many others see this as unfair and will want to be at least acknowledged as having worked on the project by having their names listed within any write-up or presentation. Their attitude is, why should the researchers get acknowledged and receive the benefits of publication—but not themselves, when remote viewing is time-consuming and hard work? This is especially true for those who have already paid their dues in practice time and consider themselves professionals.... This acknowledgment, or potential for acknowledgment, will also, in a very small way, serve as some compensation for their time. This can be done without attaching their names to the data, although occasionally a viewer may have done extraordinarily well across an entire study and would benefit from revelation of their statistics or accomplishments. Participation agreements could include the option of allowing viewers to choose the level or kind of acknowledgement

> they wish to receive after project is completed and their own personal results are known.

Disclosure

Katz felt that in addition to compensation and acknowledgment, disclosure was an important ethical practice in remote viewing experiments. She said:

> It is essential that viewers are given full disclosure of what their transcripts will be used for. They also have a right to know their funding source and whether this source will be receiving their transcripts or copies of their transcripts, and if so, what is the reason behind this. For research-based projects, viewers should be able to keep copies of their own transcripts and viewer feedback materials and to freely share these once the project is completed. For applied or operational projects there may be more restrictions to protect the identity and privacy of clients.

Precognitive Tasking

Precognitive Participants' Characteristics

Multiple experts indicated that they thought the same characteristics for viewers that applied to clairvoyant tasking also applied in precognitive taskings (Thompson-Smith, Atwater, Daz Smith, Husick, Knowles, and Müller).

Thompson-Smith also stated that it was important that they "have no expectations" and are "open to receive data." Knowles also added, "I prefer to work alone for alphanumeric targets" but would apply the same criteria as he gave for clairvoyantly tasked viewers if working with a team.

Some experts thought that the differences should be more substantial for precognitively tasked viewers. For example, while Mossbridge stated clairvoyantly tasked viewers should be more focused on events, objects, and processes than people and be more structured and less empathic, she said that for precognitively tasked viewers, they should "have high emotional intelligence, be connected to people more than things/events, and have a positive, loving outlook" (Mossbridge). On his part, Schöne stated that, for precognitively tasked viewers, they should have

> [the] ability to perceive thoughts from the observer's perspective over a longer period of time, mindfully slowing down physical and mental processes, willpower to hold concentration, [the] ability to (re)bring concentration to one point and hold it there, [and the] ability to let go of mental concepts and mentally go empty into a follow-up step.

Precognitive Environment

Mossbridge stated that "the environment should be exactly what makes each participant feel comfortable." However, some made more specific recommendations. Thompson-Smith stressed the need for minimal distractions, as she had for clairvoyant taskings, but added "OBE-like zone to allow bilocation/time jump." Schöne stated that the precognitive environment should contain "light natural sounds, by no means quiet or soundproof. From my experience, the mind needs a point of contemplation while the attention catches the impression that does not belong to the environment."

Precognitive Procedure

Several experts stated that the same factors they recommended for clairvoyant tasking also applied to precognitive tasking (Thompson-Smith, Daz Smith, Husick, and Mossbridge). Other experts recommended ARV for precognitive tasking (Atwater, Katz, and Knowles). Atwater stated:

> Associative Remote Viewing is what I do for precognition. [The] procedure is basically the same, except the time you need to spend in session is usually much less, since the tasking is only to differentiate between two targets. I would use someone else's software to pick the targets and track the data for long-term tasks. Currently participating in testing Greg Kolodziejzyk's new ARV system that uses AI for judging; looks promising; looking forward to using it for my own predictions.

Knowles stated:

> For ARV, prefer Unitary ARV protocol. Especially, have a tight team, strict division of labor, no crosstalk about sessions or events before or after [the] event, [the] viewer receives one photo only as FB [i.e., feedback], and enhanced feedback (even a FB session). Don't do too much ARV. Take breaks (days). Solo work in ARV: I use automatic writing, visualization, immediate knowledge ('thought'), [and] visit a

> virtual scene. Have had marked lottery success with this approach on small lotteries (Pick 3 and Pick 4).

Katz also noted that ARV projects involving multiple viewers may require a modification to the judging procedure: "If multiple viewers' transcripts are being aggregated into a single prediction per trial, there should be a decision made up front about how to handle situations where predictions contradict each other—such as to call a pass."

Katz affirmed that "displacement has been a huge factor in ARV and provided a list of strategies to mitigate this risk. First, she suggested not exposing viewers to both judging photos and the prediction, or to the judging process itself, emphasizing that viewers do not need to know the identities of the judges. Additionally, viewers should not be exposed to the wagering or the outcome of the event, except in monthly or biannual reports or upon request. Viewer feedback should only consist of receiving the photo, without discussing the event, money made or lost, or any other related topics.

Katz also advised against having viewers watch the game/event or even be aware of it and recommends limiting the number of targets to avoid overloading viewers in a single day. She emphasized the importance of ensuring that viewers receive large, clear, high-resolution feedback photos and have a way to verify that they actually spent time with them. Moreover, Katz encouraged viewers to do nothing else during feedback time but focus solely on the photo to prevent any interference from their own lives. She also suggests that the photos should be engaging for the viewers, considering personal interests such as gender, and that the judging of photos should be balanced in this regard.

To maintain clarity, Katz advised that those involved in judging and wagering should keep their roles separate and refrain from getting excited about the results until the entire event is concluded. She also stresses the need to ignore non-actualized photos entirely treating them as if they never existed.

Regarding wagering on future predictions, Katz also advised following a modest system, suggesting that for projects involving repeated trials, attempting to meet statistical goals, wagers should be modest, with an example of a $40 wager.

Lastly, viewers should either meditate in advance or ensure they are in a good, focused, well-rested, and stress-free state, both internally and externally, before engaging with the process. Müller stated that

> the same applies to targets in the future as to targets in the present. Fluctuations on the timeline, i.e., changes that can occur during the time duration between sessions and the target point in time, must be taken into account (probabilistic future). If necessary, factors that could lead to a change and their likelihood of occurring can be queried in the session in order to get a clearer picture.

And Schöne stated that "protocol-based procedures, drawing, or writing support the distraction of the thinking mind. In this sense, it could also be rhythmic sounds; my perception tells me that these things enable more psychic functions."

DISCUSSION

Our survey of remote viewing experts revealed a wide range of perspectives on best practices in both applied and experimental contexts. These should be viewed as informed opinions rather than established facts, as not all recommendations are strongly supported by empirical data.

For example, Schwartz as an expert noted the potential benefits of conducting remote viewing sessions during specific local sidereal times (LST). This idea stems from a study by his colleague, James Spottiswoode, who analyzed 1,468 free response trials and found a statistically significant correlation between LST and effect size, with a peak around 13.5 hours—suggesting a possible cosmo-physical influence on psi functioning (Spottiswoode, 1997). However, in a follow-up study, Spottiswoode and Edwin May reanalyzed additional datasets and failed to replicate the LST correlation, raising questions about the robustness and generalizability of the original finding (Spottiswoode & May, 1997).

Some of our surveyed experts expressed a preference for viewers trained in Controlled Remote Viewing (CRV). Despite its popularity, there remains a lack of empirical research directly comparing the efficacy of CRV with other remote viewing methodologies. To date, few methodological studies have systematically tested whether CRV yields more accurate or reliable results than alternative approaches, leaving this an open question in the field.

Displacement effects, defined as using psi to accurately describe something other than the target such as the next target in a series, or a decoy photo in a judging set, or a photo that the project manager has taped to their computer, was

another common theme, referenced by Katz and others. Although a wide array of concerns about displacement date back to psi research in the 1940s (Katz & Knowles, 2021), contemporary empirical studies explicitly focused on this issue remain limited. Julie Milton's doctoral dissertation found mixed evidence supporting displacement as a consistent explanatory factor (Milton, 1997), though many researchers, project managers, practitioners, instructors and students continue to cite anecdotal evidence for its occurrence, and members of the *Society for Scientific Exploration* and the *International Remote Viewing Association* are currently exploring this through methodological research that will soon be completed.

Despite the current lack of definitive empirical support for some of the views expressed, we argue that these expert insights—rooted in years of applied practice, experimental observation, and professional collaboration—offer valuable contributions to the ongoing development of remote viewing protocols. Their perspectives reflect the diversity of approaches within the broader remote viewing community, which includes researchers, operational project managers, and practitioners.

We observed that many expert comments were complementary, while others reflected diverging views. Rather than seeing these differences as problematic, we interpret them as indicative of the complex and evolving nature of remote viewing research and practice. The collective observations offered through this survey can serve as a constructive guide for those involved in both applied and experimental remote viewing investigations.

LIMITATIONS

There are several limitations to this study. First, the sample size was relatively small, consisting of 11 participants. While each participant was recognized as an expert in remote viewing project management, their professional focuses varied. Some specialize in operational or client-based projects, while others conduct formal experiments intended for publication in peer-reviewed journals; a few do both.

Given these differences, it may have been useful to develop two separate questionnaires tailored to each group. Some of the divergent responses may reflect this distinction. For example, project managers focused on real-world applications (e.g., locating missing persons or pets) may require viewers to engage in longer, more detailed sessions, while experimental researchers may need only brief, targeted descriptions to enable blind judging of image sets.

As far as our research methodology, while thematic analysis is a widely accepted and flexible method in qualitative research, it carries inherent limitations. One key concern is the potential for subjectivity in interpreting data. Researchers may unintentionally bring their own biases or preconceptions into the identification of themes (Braun & Clarke, 2006). In this study, we attempted to mitigate subjectivity through reflective practice and researcher triangulation.

Some of the experts cited in this study are also the authors of prior studies, such as those cited in the meta-analysis by Tressoldi and Katz (2023). This carries with it a risk of circularity whereby their own studies reinforce the views they express here rather than fostering broader consideration. While these experts may not fully represent all experts in the field, the recommendations they provide here are also based on their personal experience and not simply on the experimental validation of their statements, which partially mitigates this risk.

Another limitation of the present study is that we allow the experts to present their views without detailed cross-examination, in keeping with the nature of an opinion survey. As such, there are risks of observer/experimenter bias, Type I errors in qualitative inference, and ideological trends. Consequently, the views expressed here should not be treated as absolute truths but as informed opinions that may be useful in practical situations and that can serve as points of departure for future research and discussion.

IMPLICATIONS AND APPLICATIONS

It is important to recognize that in older remote viewing studies emphasizing quantitative designs, critical contextual variables—such as the viewer's background, personal techniques, and phenomenological experiences—were often omitted or underexplored. Yet these factors may play an essential role in shaping performance and outcomes. We encourage both researchers and journal editors to support more comprehensive reporting of methodologies employed not only by the researchers but by the participants themselves and to include thoughtful discussion of individual differences and experiential dimensions even if this means making exceptions for lengthier papers and higher word counts. This survey is intended as a catalyst for dialogue around best practices in remote viewing research. By sharing these expert insights, we hope to foster greater methodological transparency, encourage interdisciplinary rigor, and support the continued evolution of remote viewing as both a scientific and applied discipline.

AUTHOR CONTRIBUTIONS

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RESEARCH ARTICLE

Prosocial Attitude Change in Response to an Anomalous Mass Sighting Event: The Phoenix Lights

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ABSTRACT

Research on individuals experiencing close encounters with unidentified aerial or anomalous phenomena (UAP) and nonhuman intelligent beings has revealed that these "experiencers" report many positive and prosocial attitude changes, along with additional anomalous experiences. Ring proposed that these individuals may gain lowered thresholds and thus heightened sensitivity to a wide range of paranormal phenomena, thereby becoming "encounter prone personalities." This research has been limited, however, by the fact that the UAP encounters reported in these studies tend to occur across widely varying geographic locations and environmental conditions. In order to obtain more "standardized" stimulus conditions, wherein witnesses all perceive either the same or a highly similar stimulus event, the present study surveyed witnesses to a singular historical event, the appearance of the Phoenix Lights on March 13, 1997. This sighting was arguably the most widely viewed and best documented sighting of UAP in history, having been covered by national and local media, as well as being the subject of a book and documentary movie. Witnesses to the event (N=117) completed an internet questionnaire of approximately 100 response items, assessing history of paranormal experiences, attitude change along five dimensions derived from principal components factor analysis and reliability analysis of Ring's Life Changes Inventory, as well as a measure of Subjective Happiness. The questionnaire also included response items to detect agreement bias and motivated confabulation. Based upon prior research, authors hypothesized that witnesses would report an array of additional paranormal and non-ordinary experiences, would experience both positive and prosocial attitude changes as a result of their encounter, and that these attitude changes would be positive and would correlate with reported subjective happiness. Results revealed that respondents reported additional paranormal experiences, in addition to their sighting, and in some cases these paranormal experiences exceeded population base rates reported in other research. Respondents' reported attitude changes across all 5 dimensions were in the expected direction. However, only one attitude dimension, Sense of Self and Connection with a Higher Power, was found to correlate independently with self-reported Subjective Happiness. Results were interpreted as generally supporting Ring's heightened sensitivity to paranormal phenomena and were consistent with other research into encounters with UAP and nonhuman intelligent beings.

KEYWORDS

Unidentified Aerial Phenomena (UAP), UFOs, nonhuman intelligence, extraterrestrial encounters, prosocial attitude change, paranormal experience, non ordinary encounters, contact experience, spiritual transformation, survey analysis, mass sighting.

Public interest in the phenomenon of UFOs has increased in recent years, coinciding with the release of videos by the U.S. Navy and their related admission that these objects, referred to as Unidentified Aerial Phenomena or Unidentified Anomalous Phenomena (UAP), are detected on radar and regularly overfly and interfere with naval carrier group maneuvers (Cooper et al., 2017). These disclosures have in turn led to efforts by the U.S. congress to hold hearings and enact legislation to make it easier for witnesses of these phenomena to come forward and submit reports and testimony without fear of retaliation or stigmatization (Cameron, 2023).

One of the earliest scientific investigations of the UFO phenomenon (Hynek, 1972) proposed a scale for "close encounters", ranging from sighting of nocturnal lights in the sky or objects closer than 500 feet away (CE-1) to more dramatic encounters that leave physical traces/effects (CE-2), all the way to sighting of beings or occupants of craft (CE-3). This scale was later modified (Vallee, 1990) with the addition of a fourth category (CE-4) wherein a witness reports "abduction" by, or interaction with, nonhuman beings. The largest number of studies of witnesses (often referred to as "experiencers") has focused upon the fourth category: individuals reporting contact with, or physical relocation or abduction by, nonhuman intelligent beings (NHIB) (Appelle et al., 2014; Clancy, 2005; Davis et al., 2013; Hopkins, 1987; Jacobs, 2008; LeLieuvre et al., 2010; Mack, 1994, 1999; Marden, 2015; Ring, 1992; Rodeghier et al., 1991; Ring, 1992; Spanos et al., 1993). The term "alien abduction" has become commonplace, ("abduction" being defined by the Merriam-Webster dictionary as "to seize and take away (a person) by force"). The terms "alien abduction" or "abductee" may be misleading characterizations of encounters with NHIB, however, since many, if not most such contacts with NHIB have been found to be positive and even desired by the experiencers (Appelle et al., 2014; Hernandez et al., 2018). Research on "abductees" (Mack, 1994, 1999; Ring, 1992) found positive attitude and personality changes, along with favorable responses to the nonhuman contact experience among so-called "abductee" subjects. Similarly, in a study by Hernandez et al. (2018), 71% of respondents with "conscious memory of being aboard a UFO craft" reported their contact aboard with nonhumans as being "More egalitarian, with permission and compassion", and 84% of all individuals experiencing contact with nonhumans indicated they would not stop their contact, if given the choice. More negative (e.g., fearful or traumatic) reactions to contact tended to occur in response to an individual's initial, early contacts, with reactions becoming significantly more positive with repeated contact over time. Thus, the criterion for defining a study participant as one who has experienced "abduction" becomes questionable, given the context and nature of nonhuman contact, and needs to be more carefully defined. When an experiencer is transported to another location, such as a craft or facility used by nonhumans, the encounter might better be described as an "interaction with physical relocation", unless the involuntary nature of the relocation can be determined.

A number of theories have been put forward to suggest that experiencers of contact with UAP and NHIB might be misreporting their encounters due to traits such as "status inconsistency" (Warren, 1970) or "fantasy proneness" (Wilson & Barber, 1983). However, trait theories have not been supported by subsequent research (see for example, Marden, 2015; Parnell & Sprinkle, 1990; Ring & Rosing, 1990; Ring, 1992; Stubbings & Wong, 2024). Another theory to explain misperceived NHIB contact is "sleep paralysis" (Clancy, 2005), wherein a dreamlike state experienced by a person upon awakening could be associated with feelings of paralysis that lead experiencers to believe they are being immobilized and taken aboard a UAP craft. This theory, however, does not explain NHIB encounters during normal daylight hours, or when the experiencer is wide awake and moving. Moreover, neither trait nor sleep paralysis theories can explain the diversity of contacts reported, the lengthy duration of some contacts, the powerful sense of reality reported, or simultaneous NHIB encounters with multiple people. These misperception/misreporting theories also have difficulty explaining the fact that experiencers may be reported missing by others during the time of their contact and that many experiencers are able to show an investigator geometric markings, wounds, or even medical implants following their encounters (Jacobs, 2008, 2015).

A major factor that has complicated research into the psychology of UFO/UAP witnesses is the sheer diversity of experiences reported, as well as the tendency of individuals to report multiple, additional non-ordinary experiences. Craft or beings may be sighted together or separately, either near the home or in other locations, preceded or followed by other paranormal phenomena, such as glowing orbs, electrical malfunctions, telepathic messages, or out-of-body experiences. (Hernandez et al., 2018). This confluence of different paranormal experiences makes categorizing participants who "have" versus "do not have" a particular experience difficult. In his (1992)

study of UFO/UAP experiencers and near-death experiencers (NDEers), Ring noted that his subjects seemed to be "encounter-prone", with lowered thresholds for perceiving a wide variety of paranormal phenomena and having non-ordinary experiences of many kinds. He hypothesized that temporal lobe changes and temporal lobe sensitivity in experiencers may make them more sensitive to UFO/UAP encounters, and may mediate access to non-ordinary or alternate realities (Ring, 1992; Ring, personal communication, December 7, 2020), such as those occurring in paranormal phenomena or near-death experiences (NDEs). In one recent worldwide survey of over 3200 UFO/UAP experiencers (Hernandez et al., 2018), of those who reported encounters with UFO/UAP and/or nonhuman intelligent beings, two-thirds (66%) reported "seeing intelligently controlled craft" with over half (52%) receiving "telepathic messages." Approximately one fourth (20-29%, depending upon country) of respondents in this study reported having "conscious memory [without aid of hypnosis] of being aboard a UFO craft" and 44% reported seeing "strange lights in your home." Moreover, reported rates of out-of-body (OBE) and NDE experiences for respondents in this study were much higher than the general population.

This diversity and high rate of multiple, non-ordinary experiences makes classification of study subjects or survey respondents problematic, since it becomes increasingly difficult to determine which non-ordinary experience may have elicited a life-altering emotional response, or what Mack (1994, 1999) refers to as "ontological shock."

Thus, the selection or sampling of study participants in order to evaluate their perceptions, along with attitudinal and emotional responses to their sighting or contact experience, would clearly benefit from a well-defined, singular, unequivocal stimulus event or condition that is common to all study participants. Inducing such an event within a laboratory environment would be difficult and would likely pose ethical challenges, given the extreme emotions that may accompany such experiences.

The Phoenix Lights Event of 1997

The appearance of the Phoenix Lights on March 13, 1997 was arguably the most widely viewed and best documented singular sighting of unidentified aerial phenomena in history. Some witnesses reported a large, solid V-shaped craft moving over the highway earlier in the afternoon, while other witnesses, estimated by a Councilwoman and Vice-Mayor of Phoenix to be "at least 10,000 people" (Kitei, 2017b), observed the object as a fixed formation, at least a mile wide, of between three and nine large equidistant spherical lights over the city of Phoenix later that night. The phenomenon was seen over the period of 3:30PM until 5:30AM the following morning, starting in northern Arizona, and moving all the way south to northern Mexico. Witnesses also reported observing fighter jets being scrambled from Luke Air Force Base attempting to intercept the object, but to no avail. Many high-resolution photos and videos of these anomalies were subjected to analysis by both military and academic experts and failed to reveal any prosaic explanation of the phenomenon (Kitei, 2017a). Based upon the widespread awareness and media coverage of the Phoenix Lights, and the fact that virtually all witnesses, including news media, described the same silent, equidistant one-to-eight-mile-wide formation of orbs and/or a V-shaped (or triangle/boomerang-shaped) solid craft, the consistency of this event was deemed by the authors to make it an ideal stimulus for a field study of witness perceptions of, and responses to, a well-documented UAP event. And while the Phoenix Lights event constituted a narrower range of encounter situations than those reported in either Ring's 1992 Omega Project study or Hernandez et al.'s (2018) study (conducted by the Dr. Edgar Mitchell Foundation for Research into Extraterrestrial and Extraordinary Experiences (FREE), henceforth also referred to as the FREE study) it presented an opportunity to at least partially replicate the findings of those studies with respect to such things as the positivity of encounters, attitude change associated with encounters, and the experience of other non-ordinary or paranormal phenomena by witnesses. Additionally, given that the core features of the Phoenix Lights event mentioned above were so well documented and relatively uniform for potentially thousands of experiencers, it was likely that variability in the stimuli and other situational factors for this event would be greatly reduced, as compared with most other studies of experiencers. Two of the authors (LDK and BE) had also experienced the event firsthand as eyewitnesses, and in their many conversations and correspondence with other experiencers of the event over the intervening years, determined that a large number of people had undergone significant personal changes as a result of their encounter in 1997 and remained eager to describe their experience.

The physical nature of the Phoenix Lights phenomenon has been extensively explored in the documenting of military and academic expert findings from analysis of photographic evidence, the testimony of witnesses across

multiple states in the U.S. Southwest, and statements of government officials (Kitei, 2017a, 2017b). Nevertheless, the authors recognize that a range of opinions still exists as to the physical nature of the Phoenix Lights, even within our own eyewitness sample. The present research will therefore not focus upon the physical nature of the phenomenon, but will rather investigate the perceptual, attitudinal, and behavioral responses of witnesses to a singular event of high strangeness.

Hypotheses

Based upon both prior research and the authors' experience with the phenomenon of sightings and related contact with nonhuman intelligence, the following hypotheses were formulated.

Hypothesis 1 – Multiple Paranormal Experiences

If witnesses to a major sighting event experience lowered thresholds for other paranormal phenomena as Ring (1992) observed, we would expect our survey respondents to endorse at least several additional paranormal experiences which may or may not be associated with UAP or nonhumans. This would also be consistent with Hernandez et al.'s (2018) finding of high base rate endorsement of paranormal and non-ordinary experiences among those reporting sightings and contact with nonhuman beings. The term "non-ordinary" is used in addition to the term "paranormal", to connote the wide range of unusual phenomena endorsed by experiencers in Hernandez et al.'s (2018) FREE study. These included not only psychic phenomena and encounters with NHIB, but also orbs appearing in the home, near death and out-of-body experiences, and occasions of being transported to a "matrix reality" defined as "a reality with no boundaries, similar like you are in the middle of outer space."

Hypothesis 2 – Positive and Prosocial Attitudinal Changes

Ring (1992) and Hernandez et al. (2018), both of whom employed Ring's Life Changes Inventory to measure attitude change, found that encounters with UAP and nonhumans produced shifts in attitudes towards referents such as one's inner spiritual life and search for personal meaning; sense of connection to others' suffering and desire to help others; reduced concern for wealth, fame, ambition, and lowered fear of death; one's sense of self and connection to a higher power; and concern for the Earth, nature, and ecology. That such powerful and transformative change can occur in people as the result of a profound, ineffable experience was recognized early in the 20th century by such writers as William James (James, 1902/2009). James wrote about mystical experiences, wherein a sudden personal mystical insight or "persuasion" can lead a person to feel closer to the divine, connected to "the all" ("monistic"), acquiring a sense of inner peace, optimism, and reduced fear of death. Given the direct personal experience of two of the authors (LDK and BE) with the Phoenix Lights, and subjective reports of Phoenix Lights experiencers received by one of the authors (LDK), we expected that the attitude changes documented by Ring and Hernandez et al. would also occur among Phoenix Lights experiencers.

Hypothesis 3 – Positivity of Encounters

While such experiences as sightings, encounters with nonhumans, and other non-ordinary experiences may at first elicit a sense of "ontological shock" (Mack, 1994, 1999) and associated trauma, it is expected that with repeated exposure, due to subsequent paranormal experiences or repeated media coverage of the original event or similar events, these reactions should transition to more positive feelings over time. This would be consistent not only with Hernandez et al.'s (2018) finding that positivity increased with frequency of contact, but also attitudinal research on the "exposure effect", showing that "familiarity breeds comfort" and that positivity increases with repeated exposure to a stimulus event (Oskamp & Scalpone, 1975; Scalpone, 1975; Zajonc, 1968).

Hypothesis 4 – Positive Attitude Changes Should Influence Subjective Happiness

Lastly, if as expected, sightings or reported interactions with NHIB are associated with such powerful positive attitude changes towards the self and others, towards life and death, and towards the environment, it would follow that these changes should be associated with a change in the experiencers' subjective happiness. Relating these experiences to subjective happiness was thought to be important, given its importance in the study of positive psychology as a measure of an individual's psychological well-being. Subjective happiness has been utilized as an outcome measure across a variety of disciplines, such as neuroscience, health, and psychiatry, encompassing studies of physical and mental health, psychotherapy effectiveness, the classification of individual strengths and virtues,

soldier fitness, and educational effectiveness (Seligman, 2019).

METHOD OF APPROACH

The greatest challenge in conducting a questionnaire study of this phenomenon was perceived by the authors to be recruiting a sample of respondents who were suitable for testing the hypotheses for the study. Fortunately, one of the authors (LDK) had elicited correspondence from a sizable number of Phoenix Lights experiencers in response to her (2017) book, documentary movie (2005), Facebook page, website, and public appearances related to the phenomenon. This resulted in the construction of three sampling frames for the study:

1) Group 1: Correspondents for whom there existed a valid email address. Approximately 200 individuals had corresponded with one of the authors (LDK) and appeared to have a valid email address at the time of the study. This group was sent an email inviting participation and providing a link to the online survey. While email addresses for these individuals were known at the outset, no identifying information was collected or tracked, so that actual survey respondents remained relatively anonymous.
2) Group 2: Visitors to https://thephoenixlights.net website. A separate survey link was posted on the website with the instructions: "If you had an experience related to the PHOENIX LIGHTS click HERE to take our anonymous & confidential SURVEY." Visitors to the website were presumed to be individuals with an interest in the phenomenon and who might include actual witnesses. Once again, no identifying information was collected on respondents.
3) Group 3: Listeners to Coast-to-Coast AM (C2C) broadcast. Following a C2C program about the Phoenix Lights that included an interview with one of the authors (LDK), the host posted a separate survey link on the C2C website, allowing any listeners who had an experience like the Phoenix Lights to participate.

The two survey links posted online invited visitors who "...had an experience related to the Phoenix Lights" to click the link and complete a questionnaire.

The intent was to select from the total group of all respondents those individuals who would constitute witnesses to a "mass sighting event." For the purposes of this study, we would define a mass sighting event as an inexplicable UAP anomaly, witnessed by 100+ individuals, within the same approximate time frame and location. If successful, this study would be the first known instance wherein a large number of these "experiencers" were systematically surveyed to determine their perceptual, attitudinal, and psychological reactions to a singular event.

Survey Measures

Upon clicking the survey link, respondents were taken to a consent form providing a rationale for the survey, along with risks, benefits, anonymity/confidentiality provisions, and statement about the voluntary nature of the survey. Respondents had to indicate that they were at least 18 years of age, had read and understood the Consent Form, and agreed to participate in order to access the questionnaire.

Demographics and Information About the Respondent

A decision was made to limit demographic descriptor items to minimize any potential concerns of respondents that their anonymity might be compromised. Initial questions asked for age, gender, education, and whether they had witnessed "large glowing orbs or craft in the sky (typically referred to as the 'Phoenix Lights') DIRECTLY, with your own eyes?" Subsequent questions asked about the time and location of sighting.

Reactions of Respondent and Family Members to Sighting

The next set of questions asked respondents to rate their emotional reactions and those of family members to their sighting, as well as exposure to media coverage of the Phoenix Lights from other sources. They were also asked to indicate what they thought the lights consisted of.

Subjective Happiness Scale

Respondents next encountered a four-item Subjective Happiness measure. This measure was developed by Lyubomirsky and Lepper (1999) and has been widely used in positive psychology research both within the U.S. (e.g., Kurtz & Lyubomirsky, 2012) and cross-culturally (Gardiner et al., 2020). Pursuant to study objectives and hypotheses, the authors wanted to see how this measure might correlate with any changes in attitude measures.

Measures Related to Contact with Nonhuman Intelligent Beings (NHIB)

Since individuals who report memorable sightings of UFOs/UAP often report contact with NHIB (Hernandez et al., 2018) we asked respondents "Have you ever seen or interacted with non-human intelligent Being (NHIB), such as an extraterrestrial, ghost, spirit, or Light Being?" What followed, if the respondent answered "Yes", was a set of 24 questions about the nature of this contact: how real the contact seemed, age at time of first contact, degree of conscious recall of contact, frequency of contact, whether the respondent would choose to cease contact, timing of contact relative to Phoenix Lights, nature of any communication with the NHIB, types of beings encountered, and a variety of other questions about the primary being encountered. If respondents answered "No" (i.e., no contact with any NHIBs) they bypassed these questions and started the next portion of the questionnaire.

Other Non-Ordinary and Paranormal Experiences

As mentioned earlier, another common occurrence with individuals encountering UFOs/UAP is a high frequency of non-ordinary and paranormal experiences (Hernandez et al., 2018; Mack, 1994, 1999; Ring, 1992). Consequently, a series of 16 questions asked respondents about other paranormal experiences they might have had, for which they could respond "No", "Uncertain", or "Yes". These response items included such things as having memory of being aboard a UFO craft; seeing a UFO craft close up; having a near death, out-of-body, or cosmic consciousness experience; bedroom visitations or healings by nonhumans; receiving telepathic messages or powerful sensations of others' feelings; experiencing unexplainable electrical or electronic reactions or malfunctions, and other psychic or channeling experiences.

Items to Detect Agreement Bias and Motivation to Confabulate

Agreement or acquiescence bias is a well-known source of measurement error in survey research (see for example, Krosnick, 1999). This occurs when respondents are motivated to simply agree with any statement on a questionnaire. This can be mitigated to a degree by including response items that are reverse scored (for example, a negative or "Disagree" response results in a higher score on a particular scale or dimension). However, detection of biased records is preferred, and so the authors included three response items which, in our own experience and that of colleagues who have interviewed many hundreds of UFO/UAP and NHIB experiencers, were highly unlikely occurrences during a contact or sighting experience. One of the items asked respondents if they recognized a purely fictional individual. It was assumed that any respondent who endorsed all three items would be indicating an unacceptable degree of acquiescence or agreement bias.

Another concern was the possibility that a respondent who wished to feel "special" or to seek attention from others might endorse a high number of non-ordinary experiences or assert an unwarranted degree of certainty about these phenomena. Consequently, several response items were included to assess these tendencies. The intent was to correlate responses to these items with the frequency of endorsement for a range of paranormal phenomena germane to the study hypotheses, and thereby determine whether such motives might influence the tendency to report such experiences, which could in turn exert a confounding effect on our conclusions.

Attitude Change Measures

Powerful experiences, such as encounters with UFOs/UAP, NHIB, or near-death experiences have been found to be associated with a wide variety of attitude changes (Hernandez et al., 2018; Ring, 1992). To assess these changes, response items from Ring's Life Changes Inventory were subjected to a principal components factor analysis, with varimax rotation (SPSS 19), using response data from the FREE worldwide study of experiencers of contact with UFOs/UAP and encounters with NHIB (Phase 2 data N=1919) (Hernandez et al., 2018). Factors derived from this analysis were adjusted by adding or deleting response items to maximize Cronbach's alpha reliability (Cronbach, 1951) for each response scale. A total of five measures were derived for use in this study: Measure 1: Inner Spiritual Life (8 response items): assessing interest in psychic phenomena, spiritual feelings and concern with spiritual matters, understanding of life and sense of meaning, self-understanding and desire to achieve higher consciousness; Measure 2: Connection with Others (9 response items): compassion for and desire to help others, ability to listen to and love others, empathy and sensitivity to suffering of others, and insight into others' problems; Measure 3: Concern for Wealth, Ambition, Fame, and Status, Fear of Death (8 response items): assessing concern for material things and becoming wealthy, achieving a high standard of living; concern for making a good impression and becoming well

known, competitive tendencies, and fear of death; Measure 4: Sense of Self and Connection with a Higher Power (6 response items): belief in a higher power and sense of God's presence, feelings of self-worth and self-acceptance, sense of a purpose in life and understanding of self; Measure 5: Concern for Earth, Ecology, and Nature. (3 response items). (More discussion of scale reliabilities appears in Results section below). Response items began with directions: "Each statement below should be understood as beginning with the phrase, "As a result of my interest in UAPs/UFOs and/or contact with nonhuman intelligent Beings…." Following each item was a Likert-style response scale: Strongly Increased, Increased Somewhat, Has Not Changed, Decreased Somewhat, Strongly Decreased.

Open-Ended Question

At the end of the questionnaire, one free-response question was provided to assess any behavioral changes that respondents may have undertaken as a result of their experience: "Please complete the following sentence in your own words (50 words or less): As a result of my "Phoenix Lights" experience, one new or different thing I've done is … ". Two of the authors (BE and RS) agreed upon 7 response categories to be used in grouping the verbatim responses. Each of us sorted the verbatim responses independently, resulting in 83% agreement on first pass, then convened to discuss and decide upon classification of any items that seemed ambiguous or instances where we had sorted them differently.

Speeder Analysis

A well-known source of bias in online surveys is the tendency of some respondents to race through a questionnaire, responding in a superficial or haphazard way. This can result in a wide variety of response biases, including erroneous or invariant responses, the latter being known as "straightlining." (See for example, Grezski et al., 2015; Zhang & Conrad, 2014). This necessitates rank ordering survey records by completion time (using start time and completion time stamps in the SurveyMonkey data file) and inspecting the records of individuals who spend an inordinately brief time on the questionnaire ("speeders") for unusual or invariant response patterns and other anomalies. For the present study, problematic records were detected and a decision rule was adopted to discard records wherein the respondent's completion time was beyond one standard deviation below the average completion time for the dataset overall.

RESULTS

The Sample

Pooling of samples from each of the three sources mentioned above yielded a total of 1053 records. The speeder analysis removed almost all aberrant records; for example, records where a respondent had typed meaningless responses to fill-in questions, invariant or undecipherable responses, or simply had too few responses to be useful. An additional two records were judged to have agreement bias, since respondents had endorsed all three "rare response" items, and these records were discarded. The result of this data verification process was a final sample of N=980 records. Within this sample, a total N=117 individuals indicated that they had witnessed the Phoenix Lights in "In 1997 (most famous, well-known appearance)", "with their own eyes", in Arizona. This sample required approximately 22 months of survey data collection before the authors felt that sufficient sample size had been attained and was termed the "Phoenix Lights sample." This sample excluded individuals who endorsed an experience at some time other than 1997 and/or in some place other than Arizona, since it was believed that all members of the sample should share the same, singular experience. (The remaining 863 individuals had experiences at other times or in other places.) The proportions of respondents in the Phoenix Lights sample from each of the sample sources (experiencer correspondents, visitors to *thephoenixlights.net* website, or Coast-to-Coast AM listeners) were not significantly different from what would be expected, given the size of each source sample (Chi Square (2df) = 1.334, p=.513). Results for the subsequent analyses will pertain to this Phoenix Lights sample.

Demographics of Phoenix Lights Sample

Respondents were somewhat balanced by gender, with 51% male and 49% female. No one indicated a nonbinary gender identity. The age distribution was somewhat skewed toward older respondents, with 65% being 55 years or older (respondents had to assert they were at least 18 years of age to click through the consent form and access the questionnaire), though the Age at Time of Sighting was somewhat more normally distributed, as can be seen from Figure 1 below.

Respondents 65 years or older at time of sighting are absent from the sample, likely because the Phoenix Lights event occurred 25 years prior to the start of the study

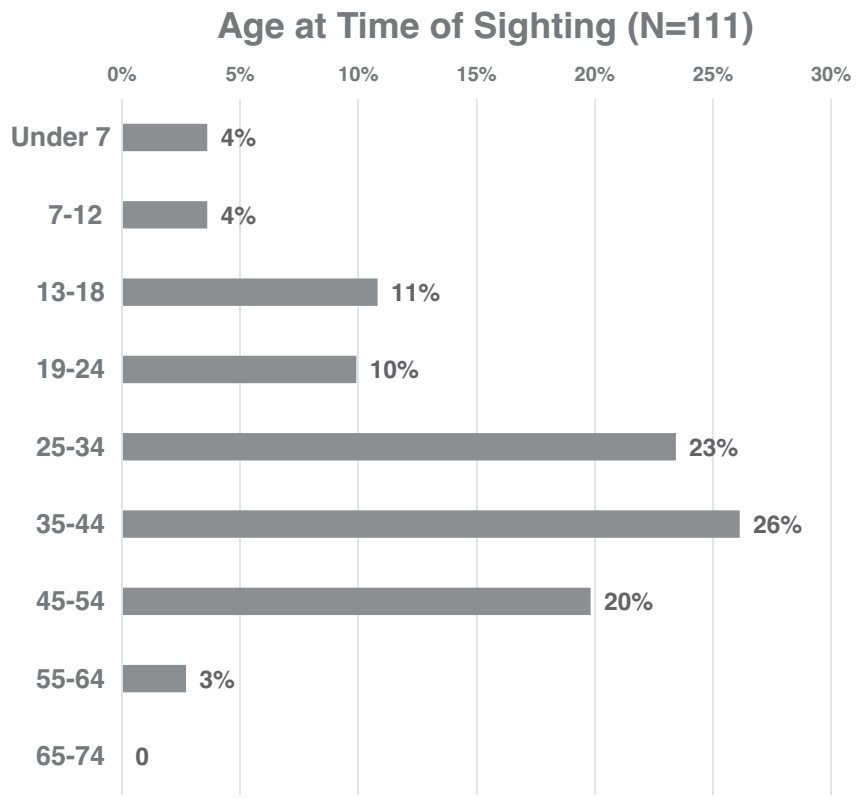

Figure 1. Age at Time of Sighting.

(2022). Anyone who was 65 at that time would have been at least at least 90 years old at the time of the study.

Education

The distribution of respondents by reported level of education is shown in Figure 2 below. Most respondents indicated at least some college, with 42% reporting a four-year or graduate degree.

Level of educational attainment did not appear to be a major differentiator for the types of experiences reported by respondents. Differences in reported paranormal experiences between educational levels were not significant ($F(5,111)=1.287$, $p=.274$), nor were differences in reported encounter with NHIB (Chi Square $(5df)=2.420$, $p=.788$). Differences for two of the five attitude change dimensions proved to be marginally significant: Measure 2: Connection with Others ($F(5,104)=2.351$, $p=.046$) and Measure 3: Concern for Wealth, Ambition, Fame, and Status, Fear of Death ($F(5,103)=2.326$, $p=.048$), reflecting somewhat greater attitude change for people with a four-year or trade school degree. However, when the alpha criterion was corrected for the number of tests performed (Bonferroni, 1936), these results no longer attained statistical significance.

Reactions to Sighting

A five-point scale was used to gauge respondents' reactions to their sighting: STRONG Sense of Shock or Fear, SLIGHT Sense of Shock or Fear, Neutral or No Real Reaction, SLIGHT Sense of Awe or Fascination, STRONG Sense of Awe or Fascination, as well as degree to which sighting may have changed their life in a negative or a positive way, ranging from "Highly negative effect" to Highly positive effect", again on a 5-point scale. They were also asked about experiencing a "strong bond or sense of connection" to the orbs/craft on a 5-point Agree/Disagree scale. Results are displayed below in Figure 3.

Thus, positive reactions to the sighting appear to predominate, with more than one third of respondents reporting a sense of connection to the phenomenon.

Reactions of Respondent's Family Members

One would expect that an event as widely covered on national news media as the Phoenix Lights would have been free of any perceived stigma or fear on the part of experiencers of being labeled as "crazy" by close family members, especially given that 66% of the sample reported that they also had "close friends or family members who

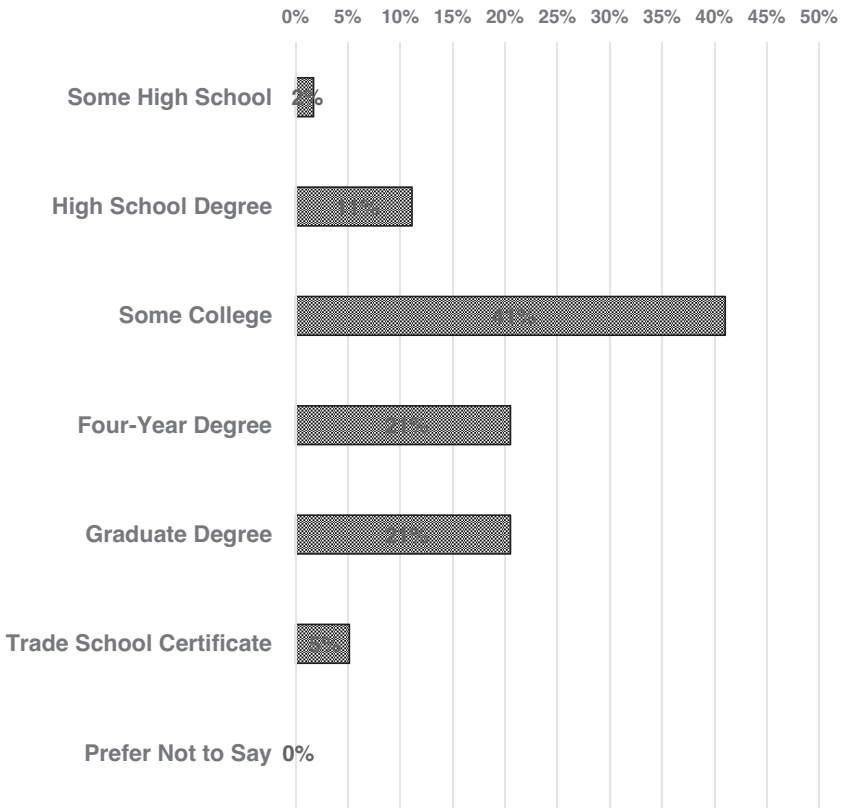

Figure 2. Level of Education Reported by Respondents (N=117).

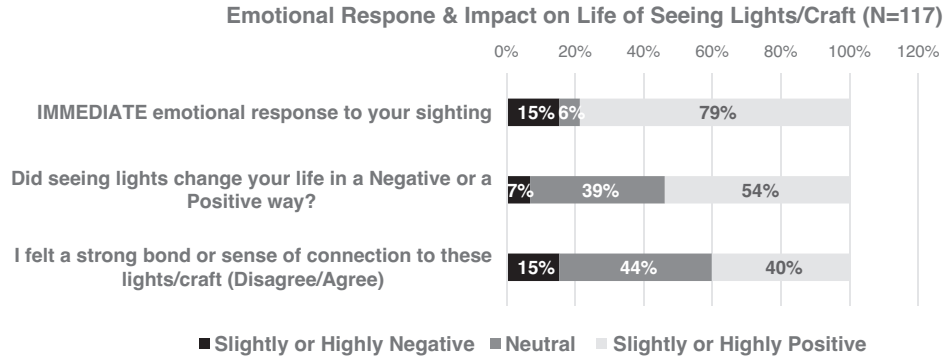

Figure 3. Reactions to Sighting.

saw the large glowing orbs or craft in the sky." This turned out not to be the case, however.

As can be seen in Figure 4, while almost two thirds of respondents reported that their immediate family members were accepting and supportive of their sighting experience, 13% say their family members did not believe them, 10% indicate their family did not want to discuss the sighting or reacted with anger or criticism, and 14% opted to to conceal their sighting from family members. Thus, it appears that a full 37% of respondents perceived some form of denial or rejection of what they had experienced.

What Respondents Believed They Were Seeing

While a number theories have been put forward about the nature of the Phoenix Lights, the majority of respondents perceived them as extraterrestrial spacecraft. This can be seen in Figure 5 below.

Clearly, the majority of witnesses did not accept the explanation of military spokespersons that the lights were "flares" that would have been dropped with parachutes during a brief military exercise. It is noteworthy, however, that 8% of witnesses perceived the lights as "Energy Beings" or "Light Beings."

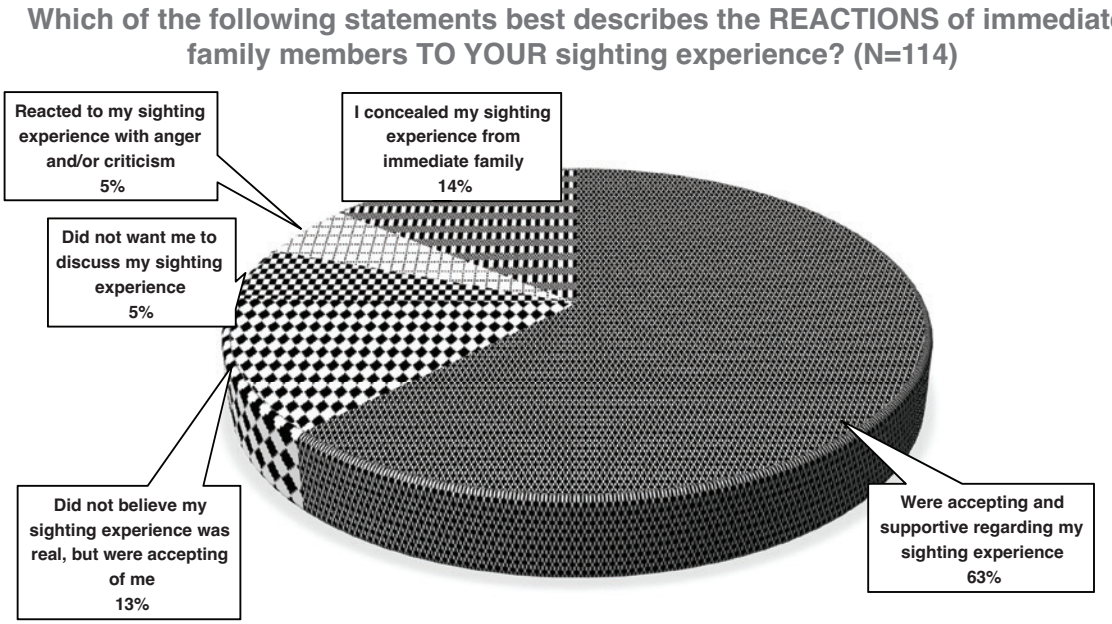

Figure 4. Reactions of Family Members to Respondent's Sighting.

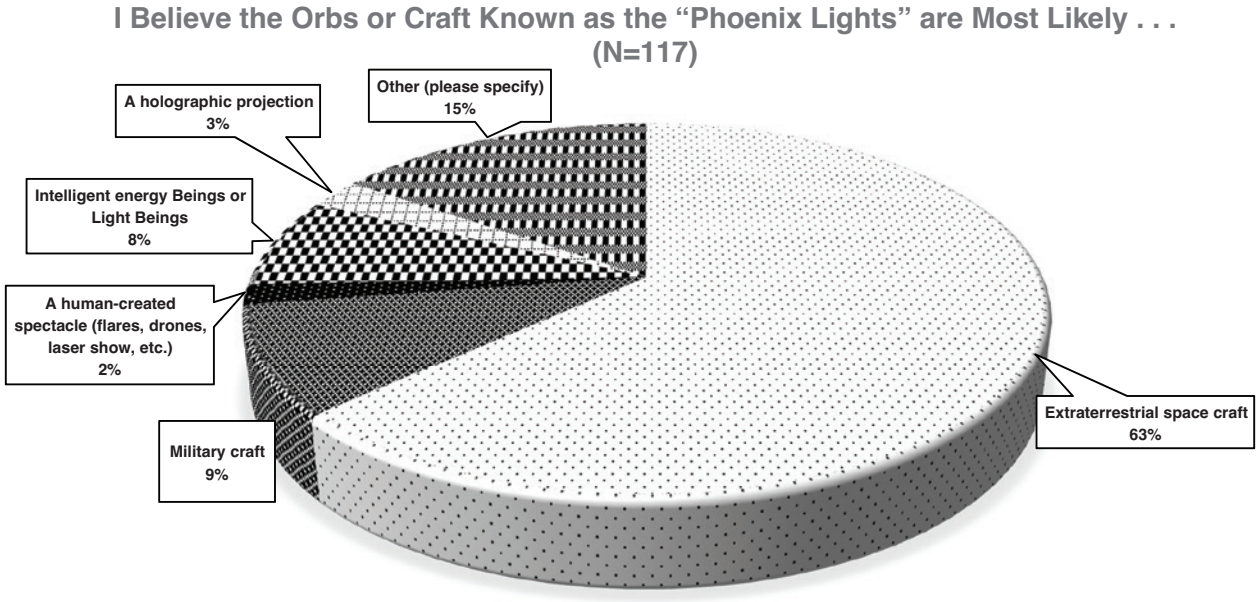

Figure 5. Beliefs About the Phoenix Lights.

Hypothesis 1 – Multiple Paranormal Experiences

Hypothesis 1 led us to expect that respondents would endorse high rates of other non-ordinary or paranormal experiences in addition to their sighting. In the FREE study (Hernandez et al., 2018), receiving telepathic messages, sighting of orbs, and malfunctioning of electrical appliances were among the most commonly reported types of paranormal anomalous activity, and such reports are also consistent with studies of the so-called "alien abduction phenomenon", wherein subjects report contact with UAP and NHI (Bullard, 1994; Randle et al., 1999).

While population base rates are not available for most of the paranormal phenomena included in Figure 6 above, other studies have indicated that about 5% of the adult population report a Near Death Experience (NDE) (Greyson, 1993; Griffith, 2009), and that between 5% and 10% of the adult population report an out-of-body experience (OBE) (Alvarado, 2000; Lopez & Elziere, 2018). Those base rate values appear much lower than the 34% of our

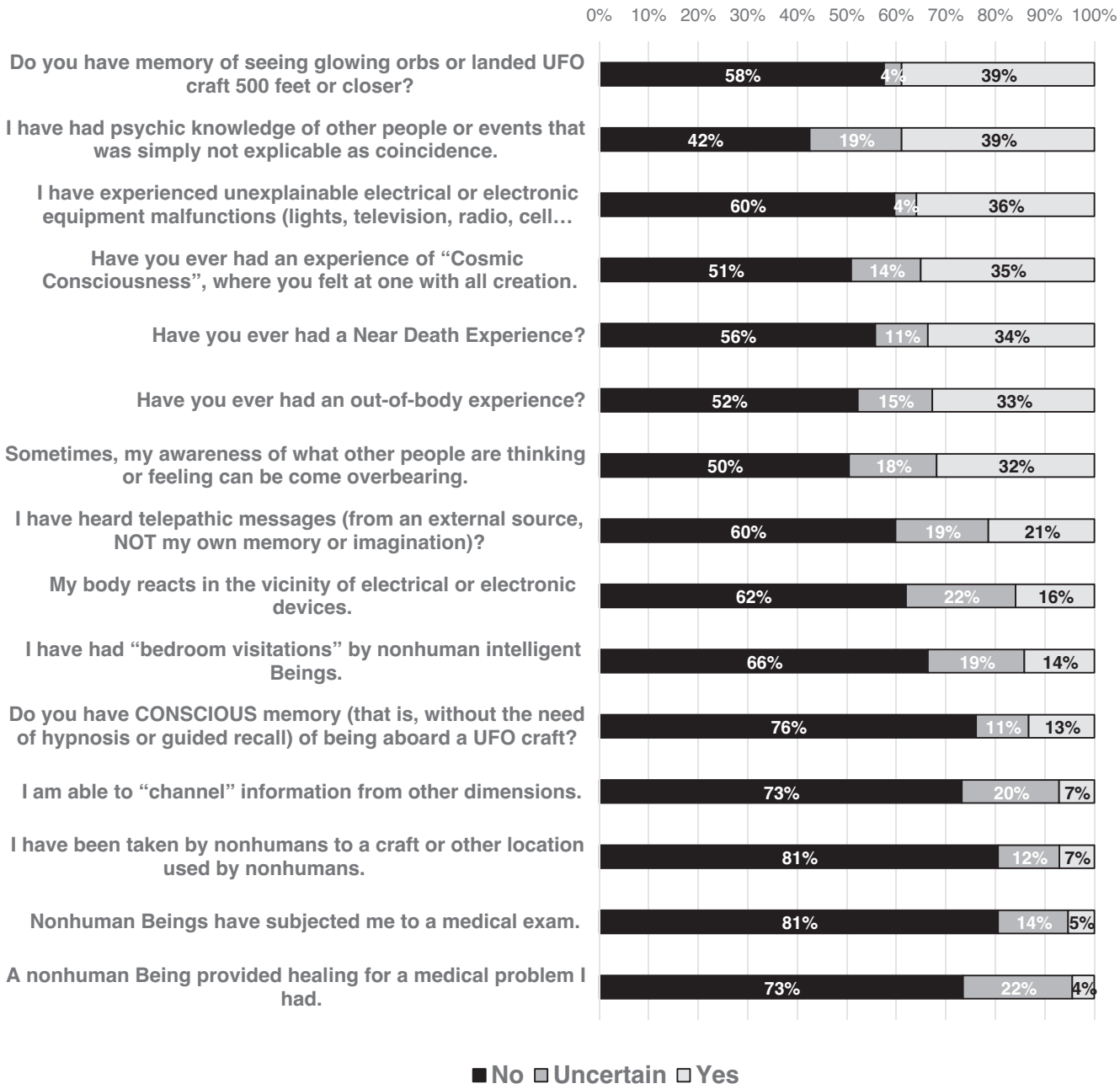

Figure 6. Non-ordinary or Paranormal Experiences "you may have had" (Ranked by percent "Yes", N=112-114).
Note. Direct comparisons with FREE study data for the above paranormal experiences are not possible, due to the fact that Hernandez et al. utilized a "Yes" or "No" response scale for most paranormal experiences, whereas the response items above utilized a 3-point scale: "Yes", "Uncertain", and" No". As a result, our rates would likely be lower than FREE's.

sample reporting an NDE and the 33% who report an OBE, respectively. Thus, for at least some of these paranormal experiences, rates of endorsement appear much higher than population expectations and consistent with the outcomes of other studies. In addition, the 13% of respondents having conscious memory of being aboard a UFO craft was approximately half the percent reported in the FREE study, yet would nevertheless appear unusual.

In addition to the above-mentioned paranormal experiences, 42% of respondents reported that they had "seen or interacted with a non-human intelligent being, such as an extraterrestrial, ghost, spirit, or Light Being" (as contrasted with 53-61% in the FREE study), and of those reporting such contact, 86% indicated that this encounter occurred "when you were wide awake and moving." The majority (71%) rated this contact as "Very Real", or

"Hyper real, intensely vivid, engaging all the senses", with a smaller number (21%) rating the reality of this contact as like "Normal Waking Awareness." When asked about the degree of conscious recall for this contact with NHI, 64% responded "Total recall – most or all details, without need of hypnosis or memory aids", with an additional 21% selecting "Partial recall – most important details, without need of hypnosis or memory aids." The remainder indicated "Fragmentary recall" (13%), or that they needed the help of a therapist or hypnotist (2%) to recover memories. Moreover, 66% of those experiencing contact with NHI reported that the nonhuman being communicated with them, most frequently via telepathy.

Motivation to Confabulate

Three response items were utilized to elicit motivation to confabulate. These items assessed respondent's report of feeling "special" because of their experience, to seek attention for reporting a non-ordinary experience, or to assert unwarranted certainty about the nature of the Phoenix Lights. A positive correlation between any one of these items and the tendency to report non-ordinary or paranormal experiences might indicate a motive to confabulate an experience. Scores on these three items were each correlated against a respondent's report for several key experiences: conscious memory of being aboard a UFO craft, encounter with an NHIB, having an OBE, and having an NDE. No significant positive correlations were found. The only significant correlation was between feeling special and reporting conscious memory of being aboard a UFO, and this correlation was slightly negative (indicating tendency to disagree about feeling special). When this correlation was corrected for the number of tests performed (Bonferroni, 1936), it ceased to be significant.

Gender Differences

Previous research has shown that female experiencers are more likely to report non-ordinary or paranormal experiences than males (Ring & Rosing, 1990). This turned out to be the case in our Phoenix Lights data as well. As can be seen in Figure 7 below, females reported these experiences at a significantly higher rates than males ($t(115df) = 2.088$, $p = .0194$, two-tailed).

The higher rate of experiences for females could be due to biological factors or gender-based biases in reporting, given that such experiences that may be construed as more or less consistent with one's gender role. However, it is unclear how biologic or reporting biases might explain such large differences in reporting on response items dealing with experiences such as "I have experienced unexplainable electrical or electronic equipment malfunctions (lights, television, radio, cell phones, etc., turning on or off on their own) around me" or "Have you ever seen or interacted with non-human intelligent Being (NHIB), such as an extraterrestrial, ghost, spirit, or Light Being?" While the study was not designed to assess potential causes of gender differences, a clue might be suggested by examining the seven paranormal experiences showing the greatest disparity between males and females. (The response item "A nonhuman Being provided healing for a medical problem..." could be included among these seven items showing the greatest disparity, since the rate of endorsement for females, while only 7%, is more than three times the rate for males). Among these seven items, four items pertain to encounters with nonhuman beings: encountering an NHIB, having bedroom visitations by nonhumans, feeling a sense of love from a nonhuman, and receiving a medical healing from a nonhuman. Thus, a higher rate of interaction with nonhumans appears to be associated with the gender difference, and might tend to facilitate additional paranormal experiences.

Hypothesis 2 – Prosocial Attitudinal Changes

As mentioned earlier, Cronbach alpha scale reliabilities for each of the five attitude change scales had been computed from the FREE study data, and from that sample, alphas ranged between .794 to .902. Prior to analyzing data for the present group of 117 Phoenix Lights respondents, scale reliabilities were recalculated, based upon the overall sample of verified respondents to the Phoenix Lights survey (N=980), to ensure that the attitude change scales remained reliable for the present study. This analysis revealed that the reliability coefficients for each scale had increased and were now in the range of .853 to .959. Average attitude changes for each attitude scale are depicted as the average increasing or decreasing difference or deviation from a null-hypothetical value of 3.0 ("Has Not Changed") in Figure 8 below. For each dimension, a one-sample t test was performed to compare average obtained increase or decrease on a 5-point scale to the null hypothesis of a 3.0 rating. Obtained differences were as follows: Measure 1: Inner Spiritual Life: mean increase = .92, $t(109df) = 11.37$, $p < .00001$; Measure 2: Connection with Others: mean increase = .82, $t(109df) = 10.37$, $p < .00001$; Measure 3: Concern for Wealth, Ambition, Fame, and Status, Fear of Death:

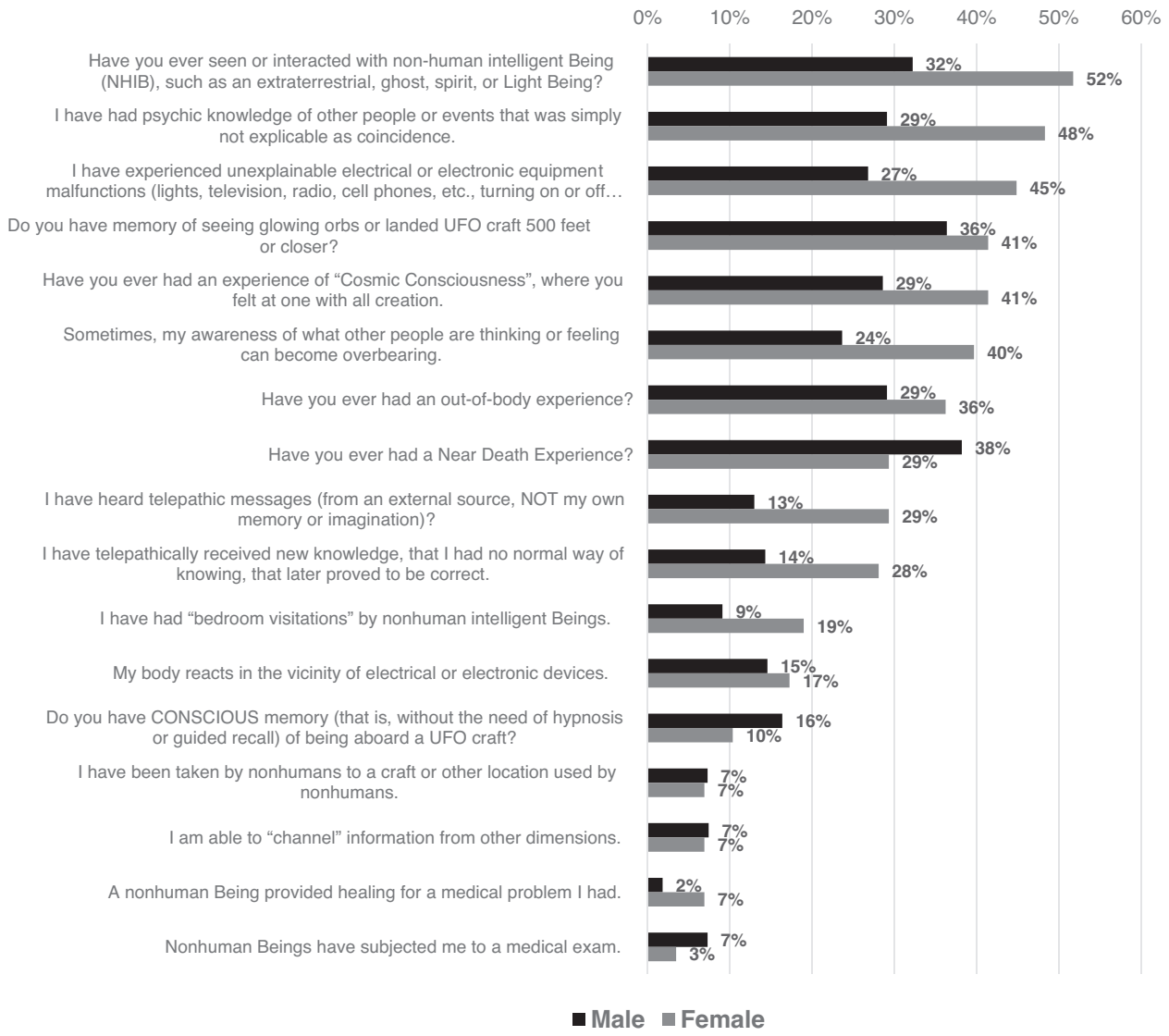

Figure 7. Gender Differences in Non-Ordinary or Paranormal Experiences by Gender (Ranked by % of females reporting experience).

mean decrease = –.36, t(108df)= –5.50, p<.00001; Measure 4: Sense of Self and Connection with a Higher Power: mean increase = .69, t(108df)= 9.16, p<.00001; Measure 5: Concern for Earth, Ecology, and Nature: mean increase = .92, t(108df)= 11.18, p<.00001. These differences are displayed below in rank order by size in Figure 8. All differences were in the expected direction and significant well beyond the adjusted (Bonferroni, 1936) alpha criterion for five t tests of p=.01.

The individual response items showing the greatest positive change (sum of "Slight" plus "Strong" increase) are rank ordered for the sample below in Table 1. What is noteworthy is the bolded items, which indicate the top ten positive changes from Ring's Life Changes Inventory found in the FREE study (Hernandez et al., 2018).

It would be expected that interest in UAP/UFOs and contact with nonhuman beings (stated in the item stem) would be associated with "the possibility of extraterrestrial life" (top rated item for positive change), or even other things of a paranormal nature, such as "interest in psychic phenomena." Other items on this list, however, appear to be connoted or implied to a much lesser degree by the question stem, unless a shift in values toward ecological, prosocial, spiritual, or personal growth themes has occurred, as evidenced in "appreciation of nature" and "concern for welfare of planet earth", "desire to help others" and "empathy with others", "desire to achieve higher consciousness" and "understanding of myself", and "my spiritual feelings." These attitude change results appear to replicate FREE study findings to a large extent.

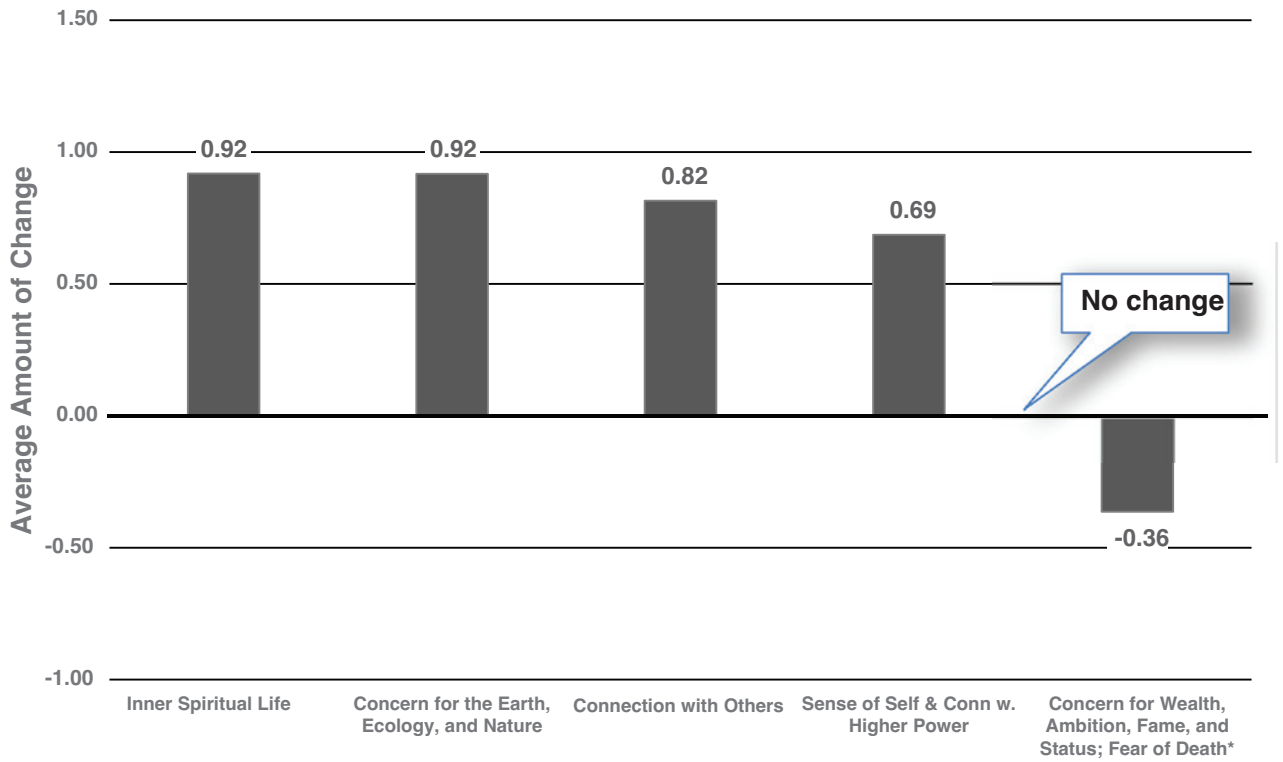

Figure 8. Attitude Change "As result of my interest in UAPs/UFOs and/or contact with nonhuman intelligent Beings…." Depicted as the Average Difference from Scale Value of 3.0 ("Has Not Changed") (N=109-110).
Note. Average change scores are rank ordered by size from left to right. *A decrease in "Concern for Wealth, Ambition, Fame, and Status; Fear of Death" dimension was regarded as a positive attitude change.

Hypothesis 3 – Positivity of Encounters

Results above indicated that sightings of the Phoenix Lights were perceived as generally positive experiences, with mostly positive impact on the experiencer's life. An equally important question would be the nature of any contact with NHIB and how people would react to those encounters.

Reported Contact with NHIB

When asked "Have you ever seen or interacted with non-human intelligent Being (NHIB), such as an extraterrestrial, ghost, spirit, or Light Being?" 42% of respondents answered "Yes". Of these, 86% indicated that their encounter occurred "when you were wide awake and moving." When asked "How real did this contact seem to you?", 71% responded either "Very Real" or "Hyper real, intensely vivid, engaging all the senses", with an additional 21% saying it was like "Normal Waking Awareness." Moreover, most of those encountering an NHIB appeared to have confidence in their recall of the event, with 64% indicating "Total recall – most or all details, without need of hypnosis or memory aids" and an additional 21% indicating "Partial recall – most important details, without need of hypnosis or memory aids." The remainder checked "Fragmentary recall" (13%) or "Little or No recall on my own. Additional memories with aid of therapist or hypnotist" (2%). Since past research has shown that people often encounter more than one type of NHIB (Hernandez et al., 2018), we asked about types of beings encountered in two ways: first, the primary type of being encountered, and second, we asked them to check any types encountered. Responses for the primary type of NHIB encountered are shown in Figure 9.

As can be seen in Figure 9, nonphysical beings, such as energy beings, glowing orbs, light beings, spirits or ghosts and interdimensionals appear to predominate reported encounters. When asked to check *any* beings they encountered, once again these same nonphysical beings predominated, although reports of physical beings typically viewed as "alien" increased substantially: short greys (17%), tall greys (13%), insectoid or mantid (15%), and reptilian (6%). Reports of angelic or religious figures also increased to almost one fourth of encounters (23%). Respondents encountering an NHIB on average checked 2.1 different types of beings, when asked to check "any that apply."

Table 1. Response Items Showing the Greatest Change "As result of my interest in UAP/UFOs and/or contact with non-human intelligent Beings..." (Ranked by percent favorable change).

ATTITUDE CHANGE RESPONSE ITEM	% Favorable Increase
My interest in the possibility of Extraterrestrial life has	**73%**
My understanding of "What is Life all about" has	**64%**
My interest in psychic phenomena has	**64%**
My appreciation of nature has	**62%**
My concern with the welfare of the planet Earth has	**62%**
My desire to achieve a higher consciousness has	**61%**
My interest in self understanding has	**59%**
My desire to help others has	59%
My sense that there is some inner meaning to my life has	58%
My search of personal meaning has	58%
My empathy with others has	58%
My concern with spiritual matters has	**57%**
My understanding of myself has	**57%**
My Spiritual feelings have	**56%**
My compassion for others has	55%
My acceptance of others has	55%
My insight into the problems of others has	54%
My concern with Ecological matters has	54%
My sensitivity to the suffering of others has	53%
My ability to express love for others openly has	52%
My ability to listen patiently to others has	52%

Note. **Bolded** items were the top ten positive change items in the FREE study (Hernandez et al., 2018).

Consistent with Ring's concept of an "encounter prone personality" was the finding that most respondents reporting NHIB encounters reported multiple encounters: 2-4 times (42%), or 5 or more encounters (37%). Moreover, 58% indicated no connection of their NHIB contact with the Phoenix Lights. Only one person encountered an NHIB only at the exact time of her Phoenix Lights sighting, while an additional two individuals encountered their NHIBs both at the time of their sighting and at other times. Two thirds of respondents encountering an NHIB (66%) indicated that the being had communicated with them, with the most common methods of communication being telepathy (52%), simply "sensing them as a presence" (65%), or "projected images" (28%) (respondents could check any modalities used). The most typical situations of interaction were given as within the home (35%), "where I am taken aboard a craft or in a facility used by nonhumans" (17%), or "telepathic communication only (no specific location)" (15%).

Positivity of Contact with NHIB

Of those respondents reporting NHIB contact, a number of questions were asked to assess the positivity of contact. These are displayed below in Figure 10. In the FREE study, positivity toward beings encountered was seen as increasing with frequency of contact, and most respondents in the present study (55%) seem to report the same phenomenon of increased liking over time. In addition, almost half report the belief that the NHIB intends to help humans evolve (49%), "truly cares about me" (45%), and that they have felt "a sense of love or goodness" from the being (45%). And while most would not assert that the being "serves as an intermediary between me and God or a spiritual source", negative responses appear as a small minority on most of these items.

Another indication of possible benefit from possible nonhuman sources was the question "Have you ever received a body of information, such as a telepathic "download" or channeling from a nonhuman being or source?" One hundred sixteen individuals responded to this question, with 28 people (24%) answering "Yes." When asked to check any type of information received in this download, 82% responded "Spiritual or religious" and 71% checked "Personally relevant information for you or about you." The large number of Neutral ("Neither Agree nor Disagree") responses for each response item above

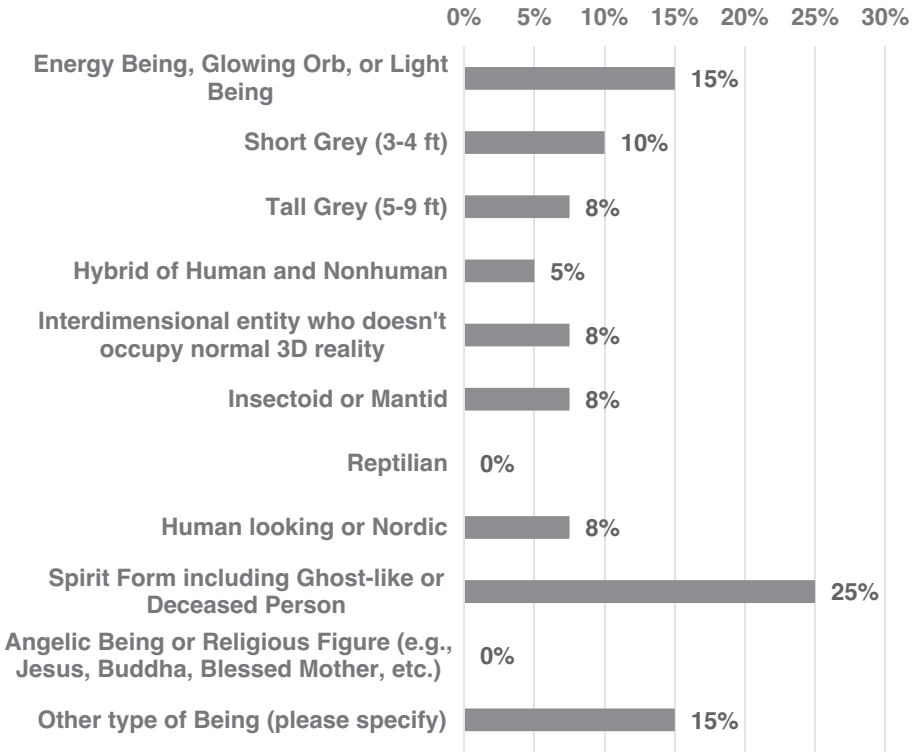

Figure 9. Responses to Question: "Which type of Being have you PRIMARILY seen or interacted with? (Check ONLY ONE)" (N=40 responding).

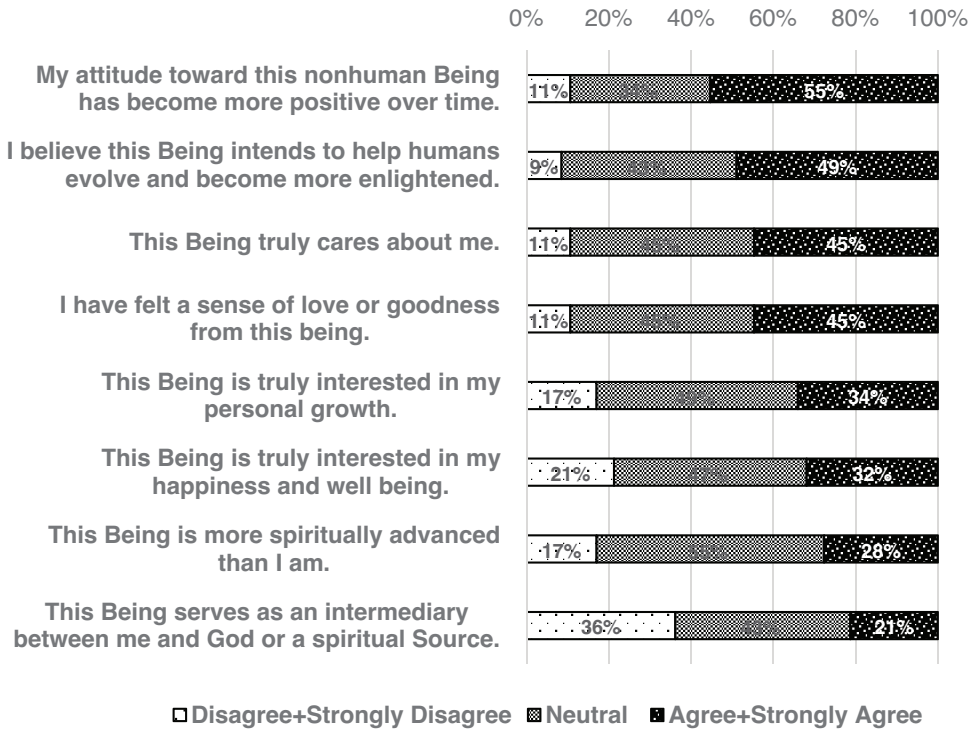

Figure 10. Questions About This Nonhuman Being ("the type you have primarily seen or interacted with") (N=47) (Rank ordered by percent Agree+Strongly Agree).

raises the question of why some respondents were unable to assess certain qualities or characteristics of the beings they were interacting with. While specific data as to the cause of these neutral responses is lacking, it is known that the communication with these beings for most experiencers was of a "Spiritual or religious" nature or

"Personally relevant information", and did not pertain to the NHIB's own personality or characteristics, and additionally, the fact that for many experiencers, the NHIB was simply "sensed as a presence". Thus, it is likely that many experiencers lacked sufficient information to make a firm judgment one way or the other. One way to better gauge positivity of beings would be to subgroup and chart responses to the above questions regarding NHIB by type of being (Energy Being, Short Grey, Tall Grey, Hybrid, etc.). This was not feasible for our sample, however, given that the many types of beings and size of our sample would result in subgroups too small to assess a reliable trend. Nevertheless, the fact that negative responses ("Disagree + Strongly Disagree") constitute a small minority for most questions about the primary NHIB encountered suggest that the impression of this being was predominantly positive to neutral.

One final question was asked about respondent's NHIB contact in order to frame their evaluation as a behavioral intention: "If you could stop all of your contact experiences with the nonhumans, would you?" Eighty nine percent responded "No", indicating a desire to continue these contacts. This result compares favorably with the FREE study, wherein 84% indicated they would not stop contact.

Hypothesis 4 – Positive Attitude Changes Should Influence Subjective Happiness

The population mean score for Lyubomirsky & Lepper's Subjective Happiness scale, reported by these authors for eight college samples, ranged between 4.63-5.07, and for three U.S. adult samples, ranged between 4.80-5.62 (Lyubomirsky & Lepper, 1999). The mean score for our sample was 5.52, with a median of 5.75. This finding suggests that our sample scored toward the high end of the range on Subjective Happiness. Correlations of the five attitude change measures with Subjective Happiness are shown in Table 2 below. Surprisingly, only one of the five attitude change measures, Measure 4: Sense of Self and Connection with a Higher Power, was significant.

Sense of Self and Connection with a Higher Power predicted Subjective Happiness, (r=.320; df=107, p<.001). The six response items comprising this measure imply a discovery of God's presence and belief in a higher power that is associated with self-discovery through one's own purpose in life, feelings of self-worth, self-acceptance, and self-understanding. The importance of this attitude change dimension was also supported by the content of verbatim responses to the open-ended question "As a result of my "Phoenix Lights" experience, one new or different thing I've done is ... " This question sought to identify enduring behavioral changes that might have resulted from the respondent's sighting experience; however, the resulting verbatim comments predominantly reflected changes in attitudes, beliefs, and interests related to things larger than oneself, and to a lesser degree, changes in one's own openness, spirituality, consciousness, and awareness. Comments received are summarized in Figure 11 below.

As can be seen in this chart, responses relating to the sense of awe and connection with the cosmos, interest in astronomy and extraterrestrial life, and questioning of reality accounted for slightly over half of all comments. Comments referenced the respondent's personality changes toward more openness and curiosity (9%), self-awareness, spirituality or religiousness, and developing of consciousness, through such means as mindfulness and meditation (7%). These reported changes would be consistent with the attitude change theme of increasing one's Sense of Self and Connection with a Higher Power.

DISCUSSION

Overall, this study provides insight into the experiences of people witnessing the Phoenix Lights, while

Table 2. Correlations of Five Attitude Change Measures with Subjective Happiness.

	Measure 1: Inner Spiritual Life	Measure 2: Connection with Others	Measure 3: Concern for Wealth, Ambition, Fame, and Status; Fear of Death	Measure 4: Sense of Self and Connection with a Higher Power	Measure 5: Concern for Earth, Ecology, and Nature
Subjective Happiness r =	0.111	0.117	–0.086	**0.320**	0.000
Significance p =	0.247	0.225	0.375	**0.001**	0.999
N	110	110	109	109	109

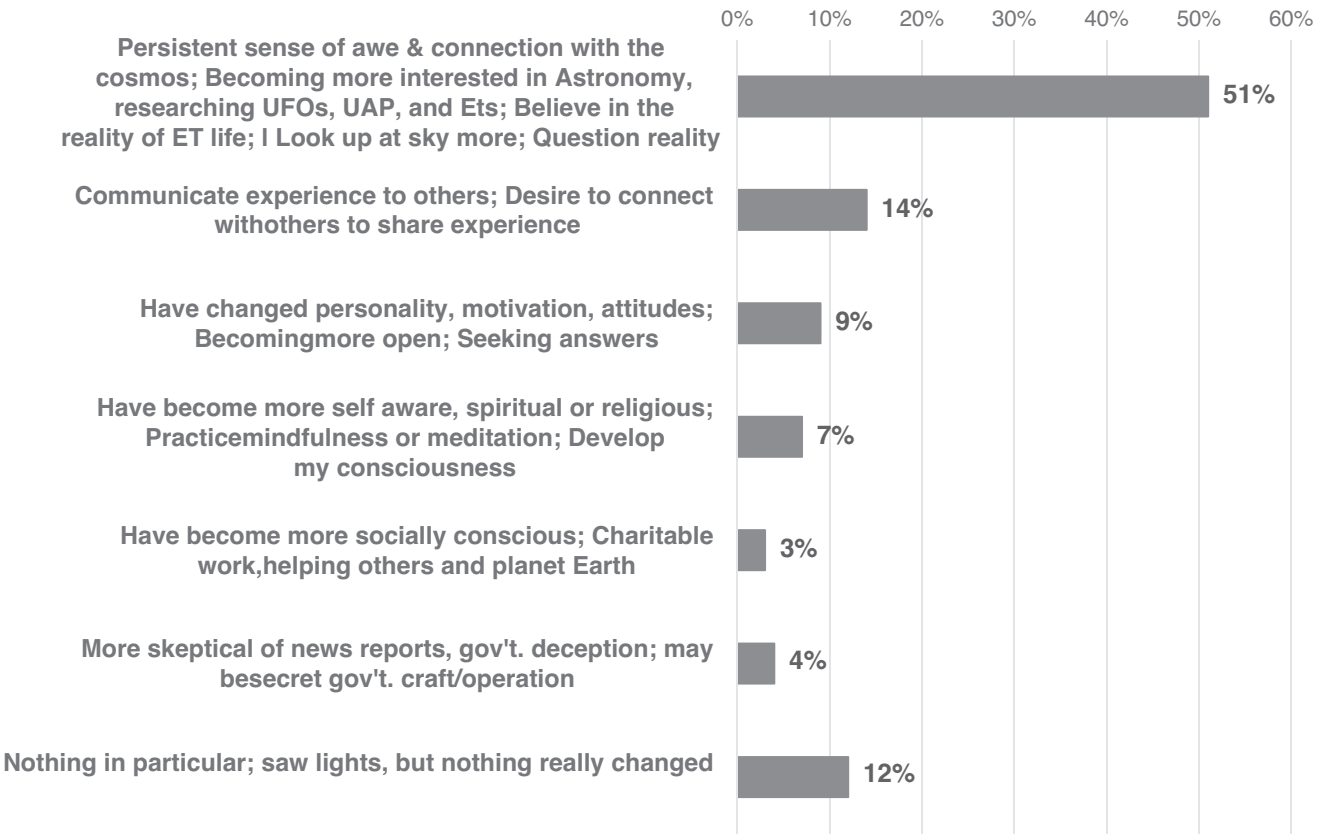

Figure 11. Summary of Verbatim Responses (N=103) to the Question: "As a result of my "Phoenix Lights" experience, one new or different thing I've done is …".

providing partial replication of both Ring's (1992) Omega Project research, as well as the FREE study, with respect to the positivity of the encounter experiences, elevated rate of other paranormal experiences, and positive prosocial attitude changes reported. Most respondents perceived the Phoenix Lights to be an extraterrestrial space craft, and most appeared to have been positively affected by their sighting. What is surprising, however, is the finding that more than one third of the sample have experienced some form of disbelief or rejection from immediate family about their sighting, despite the national and local media coverage of the event and the fact that most respondents had "close friends or family members" who also saw the lights. Psychiatrist John Mack has reported that experiencers who report being taken aboard craft by nonhumans experience a "…lifelong sense of isolation and estrangement from those around them" (Mack, 1994, p. 29), as well as how a recounting of such experiences, by those who have them, may elicit anger and hostility in others when it challenges their anthropocentric worldview, wherein humans are believed to represent the apex of creation. As Mack points out, "To destroy someone's worldview is virtually to destroy that person." (Mack, 1999, p. 36). Additionally, former Pentagon insider Luis Elizondo and other Pentagon officials have documented the intensive efforts of the U.S. government, since the 1940s, to deeply stigmatize and discourage any reporting of UFO events, not only within the general population, but even among military and commercial aviation personnel as well (Elizondo, 2024). Thus, it appears that despite congressional hearings and increasing awareness and media coverage of UAP events, talking about one's own personal experience may yet remain stigmatized for a large segment of the population.

Our Hypothesis 1, proposing many additional paranormal experiences for witnesses of the Phoenix Lights event appears to have been largely confirmed, given the number and frequency of non-ordinary and paranormal experiences reported, especially for female respondents. Similarly, Hypothesis 2 regarding positive prosocial attitude changes appears supported, given the positive direction of change on each of the five attitude measures. The fact that the seven (out of 35) attitude change response items changing the most were also in the top 10 changing items

in the FREE study (all of FREE's top 10 were within our top 14 items) tended to replicate the FREE study's worldwide findings regarding attitude change. Moreover, these changes were consistent with responses to the open-ended question, wherein positive emotional changes, such as greater sense of awe and wonder, curiosity about cosmos and ET life, a desire to share one's experience with others, becoming more open minded and spiritual, and having a desire to help others, were all expressed.

Our Hypothesis 3, concerning the positivity of encounters, was supported by the rated reactions of respondents to their sighting (79% favorable) and its effect upon respondent's life (54% favorable). Contrary to popular depictions of the "alien abduction" phenomenon, the encounters with NHIB reported by 42% of respondents appear to have been largely with non-physical entities (rather than the short gray aliens depicted in movies) and predominantly positive, with 89% of those having an encounter indicating they would not stop those encounters if they could. Also, of the 28 people who reported receiving a "download" of information from a "nonhuman being or source", more than two thirds indicated this information was of a "spiritual or religious" nature or "personally relevant information for you or about you", both of which were consistent with change on the attitude dimension Sense of Self and Connection with a Higher Power, as well as open-ended comments citing personal changes.

Hypothesis 4 proposing a link between attitude change and Subjective Happiness, led us to expect that attitude changes in most of our attitude measures should be associated with Subjective Happiness. The fact that only one measure, Sense of Self and Connection with a Higher Power, correlated with Subjective Happiness implies only partial support for our Hypothesis 4. That change in this particular dimension should link with Subjective Happiness, also appears consistent with Carl Jung's (1959/1978) thesis. Jung proposed that the sighting of round objects in the sky may elicit powerful archetypal images of order, "psychic totality", and individuation or transformation of the self through union of the conscious and unconscious.

And while it is understandable that increased Concern for Earth, Ecology, and Nature might lead to lower happiness given the current global progress on climate change mitigation, we expected that other measures, such as increases in Connection with Others and Inner Spiritual Life, and reduced Concern for Wealth, Ambition, Fame, and Status, and Fear of Death, should have also been associated with Subjective Happiness. It is also possible, however, that some negative influences upon happiness may be occurring when one has a profound, even life-changing, experience that is disbelieved or rejected outright by close family members. This outcome underscores the complexity of influences upon one's Subjective Happiness.

Limitations of the Research

The research design we utilized for this questionnaire study of psychological reactions to UAP and related phenomena posed several challenges.

Representativeness of the Sample

First and foremost is determining the specific population represented by our sample. It is reasonable to assume that respondents all had an interest in UAP/UFOs, given the websites they were visiting. And while our sample represented a wide range of age and education, it is likely that there was self-selection bias: anecdotally, some respondents sent emails to the authors thanking them for providing an opportunity to "tell their story" via the questionnaire. It is possible that people motivated to complete our 100-item questionnaire may be biased toward those having a strong emotional or life-changing experience who also lack other receptive avenues for sharing their experience.

Source of Proneness to Paranormal Experiences

It would be tempting to infer that having a UAP encounter leads to subsequent paranormal experiences, yet this is only one possibility. The questionnaire did not ask about when respondent's paranormal experiences started, and with respect to NHIB encounters, most respondents (58%) indicated no connection with the Phoenix Lights. Ring (1992; Ring, personal communication, December 7, 2020) hypothesized that traumatic experiences, such as childhood trauma or other emotional experiences that lead the individual to temporarily dissociate from reality as a defense mechanism, may "unlock" sensitivity to paranormal events such as UAP or NDEs and thereby foster a tendency to vividly recall such events. Consequently, while traumatic or "ontologically shocking" encounters with UAP or NHIB could foster encounter proneness and subsequent paranormal sensitivity, other powerful experiences, such as NDEs, OBEs, or trauma could conceivably have the same effect.

Causation of Attitude Change

The attitude change measures employed in our questionnaire did not rely upon assessing attitudes pre versus post UAP experience, but rather asked respondents to rate attitude change "As a result of my interest in UAPs/UFOs and/or contact with nonhuman intelligent Beings…", relying upon the respondents to determine the extent to which their interest had affected each attitude listed. A pre-post assessment repeated-measures design would clearly have provided a more stringent measure of attitude change for each dimension, but this was not technically feasible, given the unpredictable nature of the UAP phenomenon. Moreover, it is likely that having a non-ordinary experience, such as UAP encounter, will lead the experiencer to seek out books, videos, and websites dealing with UAP-related topics and to affiliate with people or groups who have had, or are receptive to, similar experiences. Any or all of these sources could influence subsequent attitude change. Thus, as was the case with sensitivity to the paranormal, the degree of attitude change may be influenced by the emotional or motivational strength of the initial triggering event, as well as the extent of subsequent information seeking or group affiliation behavior.

Future Research

It is hoped that future research will illuminate how personality factors or potential physiological changes might explain the relationship between an experiencer's response to an "ontologically shocking" event and associated paranormal experiences. To pursue investigation of possible factors mediating paranormal experiences hypothesized by Ring, one of the authors (RS) is currently conducting a study of experiencers of encounters with UAP and NHI, in conjunction with colleagues at the OPUS Network (a 501c(3) not-for-profit organization providing support resources and therapist referrals for experiencers). This latter study, currently in the data analysis phase, includes measures of dissociation (Carlson & Putnam, 1993) and right temporal lobe anomalies (Makarek & Persinger, 1990), along with other personality measures such as cognitive and affective empathy (Jolliffe & Farrington, 2006) that might either influence or be influenced by a profound ontological experience. And while a pre- and post-experience experimental design remains infeasible, this study includes a control group of non experiencers with only an interest in UAP. Thus, it is hoped that both this and other future research may clarify how potential experiencer characteristics or "triggering" events might facilitate or disinhibit the attitude change and high rates of paranormal experiences reported by our sample.

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RESEARCH ARTICLE

Trickster-Like Experiences While Documenting the Paranormal: Rasch Analysis of an Initial Survey

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ABSTRACT

This online study explored anomalous, trickster-like events reported by researchers while writing about ghostly episodes. A convenience sample of 167 participants (seven credentialed frontier scientists and 160 amateur paranormal investigators) retrospectively endorsed 15 items spanning both subjective experiences (e.g., unusual dreams, emotional shifts) and objective events (e.g., missing files, device malfunctions). Subjective experiences occurred 1.6 times more often than objective events, with endorsement rates ranging from 7% to 30%. Rasch analysis revealed a unidimensional hierarchy of 14 coherent items with strong internal consistency (KR-20 = .87) and minimal gender-related response bias. The reported anomalies could largely reflect psychological mechanisms such as memory reconstruction, source-monitoring errors, or cognitive load, but their clustering and symbolic framing suggest deeper epistemological vulnerabilities—what we call a "trickster chain"—when preparing paranormal themed works. These findings may generalize to other emotionally charged or liminal writing contexts where narrative coherence is vulnerable to psychological or transpersonal disruptions, offering a novel lens on how altered states, symbolic processes, and creativity intersect in scholarly work. Our novel "Trickster-Like Experiences Inventory" therefore offers a promising tool for metascientific inquiry and invites further research into both conventional and parapsychological interpretations of anomalies or disruptions in academic contexts.

KEYWORDS

artifacts, experimenter effects, hitchhiker effect, liminality, Rasch scaling.

This preliminary study was motivated by an unexpected event involving several of the present authors. In particular, a colleague alerted one of us to a "phantom citation" in Massullo et al.'s (2025a) technical report on their fact sheet about ghostly episodes, i.e., recurrent anomalies often attributed to apparitions, haunts, or poltergeists (personal communication to J. Houran, 22 June 2025). In particular, their statement—"Watt et al. (2015) noted that 12% of respondents had encountered unusual physical events they interpreted as poltergeist activity" (Massullo et al., 2025a, p. 2)—was flagged for its unfamiliar statistic and erroneous source.[1] A subsequent inspection of the authors' article notes indeed revealed that the sentence was meant to read as: "Some averaged statistics (Ross & Joshi, 1992; YouGov, 2022) suggest that approximately 12% of survey respondents have had encountered unusual physical events they interpreted as poltergeist activity."

The statistic therefore was accurate but not its supporting reference as later clarified (Massullo et al., 2025b).

The colleague speculated that the erroneous citation could be a "hallucination," or when an artificial intelligence (AI) program generates false or misleading information that looks plausible but is not based on real data (Maynez et al., 2020, p. 1906; cf. Alkaissi & McFarlane, 2023; Augenstein et al., 2024; Ji et al., 2023). This suggestion sounds reasonable given that Massullo et al. (2025a) used Large Language Models (LLM)—i.e., advanced AI systems trained to understand and generate human-like text—to help substantiate the content validity of their fact sheet. However, (a) the erroneous reference did not derive from their AI cross-referenced literature task, and (b) none of the authors either recall seeing this phantom reference during the writing and publishing process or can definitively trace its origin at this point. This situation somewhat echoes the Mandela Effect in which a large group of people share a false or distorted memory of a past event, often with high confidence, despite evidence to the contrary (cf. French, 2018). Still, we deemed the citation anomaly sufficiently puzzling to scrutinize potential explanations. Two main possibilities, though not mutually exclusive, are explored below: (a) ordinary human error and (b) anomalous "trickster" forces.

CONFOUNDING FORCES: FROM HUMAN ERROR TO TRICKSTER PHENOMENA

Errors or discrepancies may reflect deeper, more enigmatic dynamics that undermine the reliability and interpretation of historic documentation or field investigation reports in this domain. Human error, such as memory distortions, cognitive biases, or observational inaccuracies, is a well-documented factor in the recording of extraordinary events (Chabris & Simons, 2010; Drinkwater et al., 2019; Loftus, 2005). Such errors are particularly prevalent under conditions of heightened emotional arousal or ambiguity, where the limitations of human perception and memory are most pronounced (Kahneman, 2011). "Murphy's Law" is another pitfall involving everyday physics (e.g., Bloch, 1977). Matthews (1997) explained that events like toast landing butter-side down or the ubiquity of odd socks follow predictable probabilistic and dynamical laws rather than cosmic spite. By recognizing these mathematical certainties, we can reframe many disruptions to scholarly writing as inevitable outcomes of combinatorial probability and rigid-body dynamics rather than supernatural interference. In contrast, the concept of trickster effects offers a metaphorical framework to understand the unpredictable and paradoxical nature of certain confounds. Rooted in Jungian psychology and cultural anthropology, the trickster archetype embodies disruption, ambiguity, and boundary-crossing behaviors (Hyde, 1998). Within parapsychological contexts, trickster effects suggest that anomalies or disruptions associated with researchers' processes of documentation may not solely result from human fallibility but could also emerge from the interplay of psychological, social, or environmental factors that defy a straightforward or definitive interpretation (Hansen, 2001). Together, these two perspectives highlight the multifaceted origins of unexpected anomalies concomitant with writing practices and their implications for research in this domain.

Ordinary Human Error

Before adopting esoteric interpretations of anomalous experiences, researchers should obviously consider conventional psychological, physiological, or environmental explanations (Cardeña et al., 2014; French & Stone, 2013; Houran et al., 2026). For instance, in the present context many authors claim that nearly every published paper contains at least one typo or minor mistake despite multiple rounds of review and proofing (e.g., Academia Stack Exchange, 2021). Table 1 shows that these anecdotes are often affirmed by data on the prevalence of typographical, statistical, and other types of errors in scientific publications. In particular, a bibliometric analysis of seven high-impact emergency medicine journals over two decades found that 1.3% of published articles had corrections issued, with 62.5% of those related to simple typographic mistakes. Notably, 7.2% of the corrected errors were severe enough to potentially impact the study's conclusions (Vural et al., 2022). Likewise, Bhatt et al.'s (2014) study of 8,910 articles in five imaging journals found a 1.77% errata rate, with the majority involving typographical or image-related issues and 0.11% classified as major errors.

Errors with statistical reporting are no less problematic. One analysis of 157 radiology articles, for instance, found that only 10 were error-free, as well as 66% exhibited mistakes in summarizing data (Günel Karadeniz et al., 2019). Another study of 3,788 papers found that 93.3% (28/30) of the nursing journals contained incorrect representation of *p*-values (Wu et al., 2020). Citation and quotation errors are also common. A meta-analysis of quotation accuracy across medical literature found that 25.4% of references contained errors, with 11.9% being major (Jergas

Table 1. Prevalence of Error Types in Scientific Publications.

Error Type	Estimated Prevalence	Reference
Typographical or errata	High but unquantified	(Academia Stack Exchange, 2021; American Psychological Association, n.d.)
Statistical or data reporting errors	26%–96% of articles	(Diong et al., 2018; Nieminen, 2020)
Quotation or reference errors	~25% of citations	(Jergas & Baethge, 2015)
Duplicate publication (self-plagiarism)	14.2% of retracted papers	(Fang et al., 2012)
Significant-figure inaccuracies	Common but unquantified	(Morral, 2018)
Statistical inconsistencies	10%–15% of reported results	(Bakker & Wicherts, 2011; Nuijten et al., 2016)
Plagiarism	~9.8% of retracted papers	(Fang et al., 2012)
Image or data manipulation	~3.8% of biomedical papers	(Bik et al., 2016)

& Baethge, 2015). In the psychological sciences, analyses using tools like *Statcheck* (Nuijten & Epskamp, 2024) revealed that approximately 50% of articles contained at least one *p*-value inconsistent with reported test statistics (Nuijten et al., 2016). About 15% of statistical errors were serious enough to potentially change a study's conclusions (Bakker & Wicherts, 2011). Additionally, image manipulation and duplication pose concerns for research integrity. A large-scale screening of over 20,000 biomedical articles found that 3.8% contained inappropriate image duplication, with some instances indicating potential misconduct (Bik et al., 2016). These findings collectively highlight a troubling level of errors across various scientific domains, with implications for research transparency, reproducibility, and editorial practices.

Errors and omissions in private medical records are also widespread (Jacobs et al., 2007). For example, Healthwatch England's survey found that nearly 23% of patients in England identified inaccuracies in their medical records (Campbell, 2025). These included incorrect personal information, medication lists, and diagnostic labels. Among those who encountered errors, 10% received inappropriate medication and 12% were refused treatment as a direct consequence. Similarly, a cross-sectional audit of primary care medical records (Khoo et al., 2012) revealed many documentation issues, including incomplete histories and diagnoses. Additionally, 53% of records included management errors such as incorrect drug dosages and unnecessary investigations, indicating systemic weaknesses in clinical documentation practices. In the United States, a survey conducted across three health systems (Bell et al., 2020) reported that 20% of patients who accessed their electronic health records discovered at least one error. Of these, more than 40% were deemed serious by the patients, typically involving errors in medical history, diagnoses, or medication information. Errors are equally prevalent in clinical research data and administrative record. For example, Chan et al. (2008) examined the accuracy of clinical research databases and found error rates ranging from 2.3% to 26.9%, primarily due to data entry mistakes and misinterpretation of source documents. This result highlights the variability and potential unreliability of datasets used in clinical decision-making and research synthesis.

Anomalous Trickster Forces

A more provocative interpretation is that Massullo et al.'s (2025a) phantom citation was a classic "trickster" event—a concept long recognized in anomalistics and now increasingly scrutinized in parapsychology as a lens for understanding the disruptive or paradoxical features of anomalous experiences and their aftereffects. Across cultural and psychological traditions, the trickster figure appears as an archetype of disorder and contradiction who embodies mischief, chaos, ambiguity, transformation, and the unpredictable forces that destabilize established systems (Babcock-Abrahams, 1975; Hyde, 1998; Hynes & Doty, 1993; Radin, 1956; Tucker, 2020). In Jungian psychology, the trickster symbolizes the collective shadow—the disowned and inferior aspects of the self that disrupt the ego's carefully constructed image (Hyde, 1998). Tricksters therefore thrive in liminal zones—between identities, roles, or realities—where they upend conventional norms and expose unconscious tensions.

This framework characterizes trickster experiences as unpredictable, contradictory, or disruptive events that compromise the reliable observation, replication, or interpretation or documentation of anomalous phenomena (Tucker, 2020). These occurrences can simulate intelligent interference, defy systematic inquiry, and blur distinctions between authentic anomalies and psychological or environmental artifacts. Empirically, such effects have been documented in the laboratory and field both in the phenomena themselves and in the investigative process (Hansen, 2001; Kennedy, 2001, 2004, 2024; McClenon, 2024; Storm, 2023). Anomalous activity may cease in the presence of investigators (Roll, 1977), data may go missing or research equipment may malfunction (Gauld & Cornell, 1979; Houran & Lange, 1998; McClenon, 2024), or percipient behavior may shift in unexpected or erratic

ways (e.g., Houran et al., 2002b; Terhune et al., 2007), as partly influenced by social and contextual variables (Childs & Murray, 2010; Drinkwater et al., 2019; Eaton, 2019; Ironside & Wooffitt, 2021). Investigators themselves may even become unwitting participants in anomalous episodes, further dissolving the boundary between observer and the observed (e.g., Houran et al., 2022; McClenon, 2024). These phenomena frequently resist traditional scientific controls and evoke a familiar impression among researchers of being "toyed with"—a hallmark of the trickster motif.

Arguably, trickster dynamics also include so-called "paranormal contagion" or the hitchhiker effect (see e.g., McCue, 2022; Ritson, 2021). This refers to anomalous experiences at a specific "hotspot" that follow witnesses or investigators after they leave the location. Rather than remaining confined to the original site, ghosts, poltergeist activity, UFO sightings, or cryptid encounters are said to reappear at a percipient's home or travel destinations, sometimes even affecting their friends or family members. Knapp and Kelleher's (2005) extensive investigation at Skinwalker Ranch is a classic case study of contagion effects. Military and scientific observers reportedly documented several instances in which orbs, poltergeist-type disturbances, and canine cryptids appeared in their own residences after returning from the ranch. Some witnesses also reported sustained medical or psychological effects linked to these follow-home incidents, suggesting that ostensible contagion effects can persist episodically and sometimes escalate in intensity or variety of manifestations.

Empirical studies have long implicated the role of contagious processes in ghostly episodes and other anomalous experiences (e.g., Houran & Lange, 1996; Houran et al., 2022; Lange & Houran, 1999, 2001; Laythe et al., 2017). However, such "snowballing" perceptions are often explained via standard psychology such as fear responses or suggestion effects (for a review on emotional, perceptual, and behavioral forms of contagion, see Houran et al., 2025). Other times, clusters or flurries of anomalous experiences may result from Lange and Houran's (2021) "enchantment-psi loop" model. In particular, situational-enchantment is a mental state defined by a sense of dissonance and ontological shock, which is produced when one's normal waking experience is disrupted by a sudden and profound awareness that seeds a transcendent feeling of connection to an ultimate reality (Drinkwater et al., 2022).

People often become "enchanted" when delighting in art, experiencing nature, or participating in other kinds of immersive experiences that markedly alter people's perceptions or notions of reality (e.g., Lamont, 2017; Lange et al., 2022; van Elk et al., 2016). Importantly, Lange and Houran (2021) found that enchantment is not only an aftereffect of anomalous experiences but also a facilitator of successive events. Specifically, repeated path analyses of questionnaire data confirmed a self-reinforcing loop between situational-enchantment and anomalous experiences, as mediated by paranormal belief and transliminality (i.e., a "hypersensitivity to psychological material originating in (a) the unconscious, and/or (b) the external environment:" Thalbourne & Maltby, 2008, p. 1618).

Some researchers interpret trickster-like anomalies or disruptions as symbolic or liminal processes unfolding within the psyche (Tucker, 2020). Recurrent themes—such as narrative contradictions, improbable coincidences, equipment failure, and data anomalies—have long intrigued parapsychologists. While some attribute such events to a mischievous or destabilizing agency (e.g., Haraldsson, 2009), others propose more grounded psychological interpretations. Storm (2023), for instance, viewed such patterns as emergent manifestations of the trickster archetype—a projection from the collective unconscious that arises when psi research unsettles the boundaries of conventional science.

Specifically, Storm (2023) argued that the trickster "acts out" through failed replications, uncanny synchronicities, or ambiguous results that collapse the distinction between subjective observation and objective measurement. Moreover, Parker (2013) discussed cases in which an experimenter's unconscious psi presumably influenced participant outcomes, producing distinctive patterns such as mirror effects—where control-group scores are suppressed while experimenter scores are elevated—and scree-jump distributions, marked by sudden leaps just beyond statistical thresholds. This forensic-parapsychology perspective contrasts with more familiar experimenter-belief effects, in which expectancy subtly shapes performance (e.g., Watt & Ramakers, 2003; Wiseman & Schlitz, 1997), by suggesting the role of a deeper, psi-mediated mechanism rooted in the investigator's own influence (cf. Smith, 2003).

Rather than adopting the broad mythological figure of the trickster, Kennedy (2024) argued that we must translate that image into concrete, testable hypotheses about the human and cultural factors that underlie psi's apparent capriciousness. He warns that leaving "trickster" undefined risks substituting poetic appeal for scientific clarity. Instead, he proposed focusing on the well-documented roles of expectation, belief, and motivated reasoning—factors that can readily be modeled, measured, and controlled.

The preceding shows that some authorities view the trickster as a symbolic key to understanding the deep ambiguity of paranormal phenomena; others see it as a rhetorical device that deflects attention from parapsychology's more serious methodological shortcomings (e.g., Wagenmakers et al., 2012). Notably, field investigations—especially those involving poltergeists or recurrent spontaneous psychokinesis (RSPK)—often unfold in "liminal" environments characterized by emotional volatility, ambiguous social roles, or personal marginality (Lange & Houran, 2001; Maher, 2015; Roll, 1977; Tucker, 2020; Ventola et al., 2019). Such conditions are certainly fertile ground for both symbolic projection and cognitive distortion.

Ultimately, trickster-like phenomena seem to illuminate the epistemological and methodological fragility of studying phenomena that are transient, emotionally charged, and deeply context-dependent. Whether viewed through symbolic, psychological, or critical lenses, trickster-like experiences invite a deeper reckoning with the limits of inquiry into the anomalous—and with the provocative possibility that the act of investigation itself may catalyze or co-create the very effects it seeks to map and understand (cf. Parker, 2013). Kennedy (2024) thus cautioned against treating the psi-trickster as an autonomous spirit-agent. Instead, he framed it more as a "mirror" of parapsychology's own unexamined biases, tensions, and assumptions—an invitation to turn a scientific lens back on our motivations, expectations, or methodological blind-spots

THE PRESENT STUDY

This preliminary survey and analysis explores both subjective (*S*) and objective (*O*) forms of trickster-like phenomena without testing specific directional hypotheses. Rather, we sought to describe the range of anomalies or disruptions that researchers report while writing about ghostly episodes and determine whether they form a probabilistic incidence hierarchy along a single latent continuum per the Rasch (1960/1980) model. This latter result would mirror the phenomenology of *S/O* anomalies that characterize percipients' narratives of ghostly episodes (e.g., Houran & Lange, 2001; Houran et al., 2002b, 2019a). Our study defines "trickster-like experiences" strictly as unexpected or anomalous events which are experienced during paranormal-themed writing sessions and that may disrupt reliable documentation, replication, or interpretation—over and above ordinary typos or data-entry slips. This working definition guided both our item-generation and our interpretation of survey responses below.

To immediately clarify, Rasch item hierarchies have the property that for two occurrences X and Y that are reported with probabilities P(X) and P(Y), and P(X) > P(Y), this relation holds *regardless of the number of other trickster-like experiences that individuals reported*. Moreover, P(X) > P(Y) holds across all subgroups of respondents (e.g., Men vs Women, Older vs Younger respondents, etc.). The Method section explains Rasch scaling in more detail. However, we use it here not just as a measurement tool, but also as a way to uncover the underlying patterns in *how* researchers experience certain trickster-like disruptions and anomalies (cf. Moustakas, 1994).

As demonstrated in other contexts (e.g., Houran et al., 2019a; Lange, 2017; Lange et al., 2004), Rasch scaling can illuminate meaningful connections among these reported experiences and offer an empirically-grounded framework for improved recognition and documentation of such phenomena, hypothesis generation, and theory development. Specifically, Rasch scaling creates a hierarchy of events that indicates the order in which trickster-like experiences are likely to occur. Beyond issues of measurement, we also consider how trickster-like experiences may function as transpersonal signals—episodes during which ordinary cognitive boundaries loosen, enabling contact with symbolic, archetypal, or transrational dimensions of experience. Accordingly, Rasch modeling may reveal not only the structural phenomenology of these events but also point to stages within a potential transformative process.

METHOD

Transparency and Openness

Our survey administration and analysis protocol was not pre-registered, but it was approved by the Ethics Committee at Integrated Knowledge Systems and adheres to the Journal Article Reporting Standards (Kazak, 2018). Accordingly, we specify the research samples, data exclusions (if any), research questions, applicable manipulations, and all measures and data abstractions.

Participants

We used a global outreach campaign on social media combined with direct email appeals (described below) to recruit a convenience sample (N = 167, M_{age} = 51.94 yrs, SD = 8.84, range = 21–79 yrs.) of paranormal-oriented researchers comprising 68 men, 95 women, and four "other" ("I prefer not to say" = 2 and "non-binary or gender-fluid" = 2).

Respondents were segmented by (a) Paranormal Investigators (i.e., amateur scientists or self-styled "ghost-hunters") (n = 160) and (b) Credentialed Scientists (i.e., professionally trained researchers) (n = 7). This sampling difference is not unexpected considering the ratio of "citizen scientists" to active parapsychologists in this domain (cf. Hill et al., 2019).

The participants met our inclusion criteria if they reported having had any trickster-like experiences during periods of active writing about the paranormal. This included preparing research reports or case files, book chapters exploring psychological theories of poltergeist phenomena, articles about patterns in ghost reports, documentary scripts interpreting evidence for media projects on haunted landmarks, conference presentations, or popular magazine features on well-known hauntings and associated controversies. Even so, these varied contexts arguably all involve a psychological state involving strong attentional focus or narrative immersion.

Our recruitment efforts primarily targeted participants in the US and UK, but "Country of Residence" information was intentionally omitted to prioritize perceived respondent anonymity and to streamline participation. As our initial focus was to explore general trends and patterns rather than conduct cross-cultural analyses, demographic granularity was deemed non-essential at this stage. Avoiding country-level data collection also minimized potential privacy concerns and encouraged broader engagement from respondents who might be sensitive to location disclosure. This approach supports the exploratory nature of the research, allowing for efficient data collection while laying the groundwork for more targeted demographic analysis in future phases.

Measures

Participants specified their Age and Gender, as well as completed two measures in a standardized order:

Cognitive Self-Check. This single binary (*Yes/No*) item screens for psychological risk factors: "Have you either (a) used an illegal drug or misused a prescription medication within the past year, and/or (b) been diagnosed with or received professional treatment for a serious mental illness or condition?" (cf. Lange & Houran, 2024; Smith et al., 2010). Based on prior research linking substance use and comorbid psychiatric disorders to disruptions in cognition and written expression (e.g., Saunders et al., 2007; Smith & Borden, 2020), we used this index as a control variable to help account for these potential sources of trickster experiences when researchers are actively engaged in the writing process.

Trickster-Like Experiences Inventory (TEI). We developed this first-generation, content-corroborated pool of 15 binary True/False items (see Appendix) as an exploratory instrument, without a claim of final construct validity. Accordingly, no prior information on its psychometric quality are available. The items derived in part from anecdotal reports provided to us by colleagues, as well as drawing on strange events that typify ghostly episodes (cf. Houran et al., 2019a, 2019b). In particular, the items reference various *S/O* anomalies or disruptions that respondents mark if they occurred "at least once in a memorable or unusual way" while writing about ghosts, hauntings, poltergeists, or other encounter-type experiences. The rating statements do not imply a paranormal origin or interpretation for the *S/O* phenomena, consistent with other measures that distinguish between anomalous experiences vs percipient attributions (e.g., Houran et al., 2019a; Irwin et al., 2013; Lange et al., 2019). The KR-20 reliability of the raw person sums in our sample was 0.87, indicating excellent internal reliability (Kline, 2000), and we describe in the "Response Bias (DIF) Effects" section below that the TEI's Rasch scoring has a mean = 50 (SD = 10).

Procedure

We emailed invitations to a select group of professional scientists in this domain that were personally known to the authors As well, a parallel social media campaign was launched that targeted the broad community of amateur paranormal investigators (cf. Hill et al., 2019). Both approaches contained a brief description of the study and a link to the online survey. After accessing the link, participants reviewed an informed consent statement and provided consent by proceeding with the survey.

The survey was administered using Google Forms (Google, n.d.), a web-based survey tool that enables secure and accessible online data collection. Respondents completed the survey at their convenience using personal devices, and no personally identifying information was collected. The data (available on request to qualified researchers) were automatically stored on the survey platform's encrypted server and downloaded for analysis upon survey closure. Data analysis was conducted primarily by the second author, who is independent from Massullo et al. (2025a).

Rasch Scaling Primer

As detailed by Lange (2017; Lange et al., 2019), Rasch scaling places items and persons along a common latent dimension in a Logit metric. Customarily (Linacre, 2025), items' (*i*) locations are referred to as their difficulty (D_i) and persons' (*j*) trait levels are referred to as T_j. In other words, *items with higher Logit values represent content that are more difficult as indicated by their lower endorsement rates*. For Items' *p* and *q* with "difficulties" D_p and D_q, respectively, whenever $D_p < D_q$ the Rasch model (cf. Wright & Masters, 1982) Item *p* has a greater probability of being endorsed or selected than does Item *q*. Moereover, this property holds for all respondents *j*, *regardless of these respondents' trait levels (T_j).*

The binary Rasch model describes the probability P of items' endorsement as:

$$ln\left(\frac{P_{ij}}{(1-P_{ij})}\right) = T_j - D_i \quad (1)$$

The quantities *T* and *D* are estimated here via Linacre's (2025) *Winsteps* Rasch scaling software. The items' fit to the Rasch model is quantified here by their "Outfit," which represents the Mean-Square difference between the empirical responses and the responses entailed by the model. The theoretically expected Outfit value is 1.0, but values between 0.7 to 1.4 are generally deemed acceptable in practice (Linacre, 2025). The Rasch dimension is assumed to be unidimensional, which can be tested via a factor analysis of items' residuals, i.e., the differences between the empirical responses and the responses entailed by the model. We refer readers to Bond and Fox (2015) and Lange (2017) for general discussions of different Rasch item types.

Rasch scaling requires that across different sub-groups of respondents items' D maintain the same spacing. The particular spacing of a test's items is also referred to as its item hierarchy, an example of which is shown later. When the item hierarchy differs between two or more subgroups, items are said to exhibit differential item functioning (DIF) or response bias. In the case of two subgroups g_1 and g_2, Item *i*'s DIF is quantified by the difference $D_i^{g1} - D_i^{g2}$. For example, it might be the case that item *i*'s difficulty is 1.2 Logits for men but only 0.7 Logits for women, meaning that the item is easier for women than for men. Statistical tests exist (Linacre, 2025) to assess the significance of DIF effects, but differences under 0.25 Logits—even when statistically significant—often are of little practical importance. Also, note that item DIF often cancels across items and thus its overall impact on respondents' survey ratings or test scores may be minimal. The distortion in the estimation of subgroups' trait levels can be determined by comparing the raw-score to Logit translations across the subgroups.

By its very nature, the Rasch (1960/1980) unidimensional model is designed for constructs that follow a stable, ordered progression—akin to measuring height or ability. Trickster-like disruptions, by contrast, may be inherently erratic or multifaceted. As such, the hierarchy we report below should be viewed as an initial exploration of possible ordering versus definitive evidence of a single "trickster trait or variable."

RESULTS

Descriptive Preliminaries

The participants collectively endorsed all 15 trickster-like experiences, with percentages ranging from 7% to 30% across all participants. The most frequently reported occurrence across the full sample was "unusual sleep patterns or vividly thematic dreams" (30%), while "erratic computer behavior" was the least endorsed (7%). These extremes highlight the prominence of internal, dream-related effects versus the relative rarity of overt technological or tangible anomalies.

When classified by anomaly type, *feeling*-based *S* experiences—including vivid dreams, meaningful coincidences, intense attraction or repulsion to materials, emotional unsettledness, time distortions, physical sensations, and perceptions of an unseen presence—were endorsed by 14% to 30% of participants (mean ≈21%). In contrast, *fact*-based *O* anomalies such as audio corruption, device interruptions, missing files or notes, spontaneous text alterations, computer malfunctions, disappearing work, and reports of odd phenomena by others received endorsements between 7% and 21% (mean ≈13.5%). Overall, *S* trickster experiences occurred nearly 1.6 times more frequently than *O* events.

Credentialed Scientists overall endorsed nine of the 15 trickster effects (60%), primarily reporting tangible disruptions such as missing or misplaced files and disappearing or altered text (each at 29%) while preparing written work on ghosts, hauntings, poltergeists, or kindred phenomena. In contrast, Paranormal Investigators endorsed all fifteen items (100%), with the most frequent experiences involving themed dreams (31%), meaningful coincidences like odd noises or spontaneously playing media (26%), and a strong emotional response to their materials—either attraction or repulsion (26%). This disparity suggests that

professionals tend to encounter a narrower, more concrete subset of trickster phenomena, while amateurs report a broader range of *S* experiences.

A closer look at the response patterns reveals that Credentialed Scientists concentrated on *O* disruptions: 14% cited the erratic word-processing behavior, another 14% indicated work vanishing or failing to save, and an equal share described time distortions or emotional unsettledness. Paranormal Investigators, meanwhile, reported a more balanced mix of *S/O* anomalies. These included vanishing work (16%), device interruptions (18%), marked dreams (31%), emotional agitation (19%), and unexplained physical sensations such as chills or tingling (16%). Moreover, certain device and environmental anomalies—such as equipment malfunctions (14%), lighting or phone disruptions, and odd experiences by other people nearby (13%)—were almost exclusively reported by Paranormal Investigators.

Finally, note that 12% of the Paranormal Investigators (n = 19) responded "Yes" to the Cognitive Self-Check item, whereas none of the Credentialed Scientists endorsed it. This result aligns with previous findings that link ghostly perceptions to a history of psychological adversity or diminished mental well-being (e.g., Houran et al., 2002a; Lange & Houran, 2024; Ventola et al., 2019). Despite these collective investigator-related differences, the broad range of endorsement rates and the absence of floor or ceiling effects across the *S/O* phenomena confirm sufficient variability for Rasch scaling analyses. This distribution ensures reliable calibration of item difficulty along the latent continuum of trickster-type experiences when writing about the paranormal.

Rasch Scaling Outcomes

Table 2 shows the Rasch scaling results for the total sample. Linacre's (2025) *Winsteps*® software indicated that Item 3 ("Text altered without intent") had a very poor fit (Outfit = 1.80) to the Rasch model, and it was therefore omitted from all following analyses. Rather than exclude Item 3 from the scale, we have retained it in the Appendix for subsequent research, as it may uniquely identify the rarer, ostensibly inexplicable disruptions that warrant dedicated study. Incidentally, this item corresponds to the authors' own trickster-like experience as detailed in the Introduction. The remaining 14 items exhibited acceptable Outfit values, ranging from 0.64 to 1.32 Logits, i.e., below the maximum acceptable Outfit value of 1.4. Items' difficulty parameters ranged from –1.25 to 1.53 Logits, a range of 2.78 Logits. This Rasch dimension is essentially unidimensional as our factor analysis of the items' residuals found that the first (and most important) factor explained only about 9% of the residual variance.

The Rasch Logit values define a clear continuum running from highly accessible, inward-focused experiences ("thematic dreams" at –1.25 Logits; "coincidences and topic attraction/repulsion" –0.77 Logits) through a mid-point of borderline phenomena ("audio distortion and time/emotion shifts" near –0.4 to –0.2) to increasingly rare, outward-facing anomalies ("saved work vanishing" at +0.16 Logits up to "erratic computer behavior" at +1.53 Logits). In other words, *S* trickster experiences cluster at "easier" (or more probable) thresholds, while *O* disruptions require progressively stronger overall "trickster intensity" to manifest.

Moreover, the zero-Logit threshold neatly bisects internal and external events, revealing two sub-tiers: minor equipment oddities (Logits ≈ 0) and substantive data or device failures (Logits > 0.6). This bifurcation suggests a pragmatic hierarchy for further research, i.e., vivid, low-threshold experiences for early detection and the high-threshold anomalies as more robust indicators of trickster dynamics, all the while recognizing they inhabit a single, graded landscape of cognitive-environmental interplay.

Response Bias (DIF) Effects

The DIF tests reported in Table 3 indicate that the Rasch hierarchy of trickster experiences is stable across the subgroups of respondents' defined by Age (divided by the

Table 2. Items Frequency Distribution and Summary of Rasch Scaling Analyses Across Total Sample (N = 167).

	Item	Sample Count	Logit Value	Outfit
1	Erratic computer behavior	12	1.53	0.78
2	Missing or misplaced files	20	0.64	0.96
3	Text altered without intent	14	-	1.80#
4	Audio files distorted	35	–0.43	1.23
5	Devices acting strangely	28	0.02	0.66
6	Saved work vanished	26	0.16	1.20
7	Coincidences during writing	42	–0.83	1.28
8	Sensed presence in room	24	0.31	0.77
9	Thematic or vivid dreams	50	–1.25	0.97
10	Time felt distorted	32	-0.24	0.98
11	Emotion shifts while writing	32	–0.24	0.79
12	Unexplained physical sensations	26	0.16	0.69
13	Device malfunctions nearby	23	0.39	0.64
14	Others sensed odd events	21	0.56	0.97
15	Strong pull or aversion to topic	41	–0.77	1.32

Note: Computed using all 15 items. All other Outfit values cover the 14 items that remain when Item 3 is removed.

median age), Researcher Group (Paranormal Investigator vs. Credentialed Scientist), and the Cognitive Self-Check index (i.e., mental health/substance use history or not). No item varied between the respective subgroups by more than 0.25 Logits while also being statistically significant ($p < 0.01$). However, Item 4 ("Audio distorted") occurred 1.65 Logits higher for men than for women, meaning that women were *more likely* to report audio distortion than were the men with equal trait levels. This item's DIF nevertheless had a negligible effect on the estimation of respondents' overall trait levels, so we retained the item.

Table 3 also reports the differences between the various DIF subgroups referred to above. None of the four DIF variables (i.e., Age, Gender, Researcher Type, and Cognitive Self-Check) showed statistically significant differences between the subgroups, although the difference for respondents endorsing the Cognitive Self-Check item was associated with higher overall mean scores (by 0.97 Logits, $p < .02$). Note that the absence of DIF effects on the scale level implies that the differences shown in Table 3 are essentially unbiased.

Given the absence of notable DIF effects, we used the 14 Rasch items to create a "Trickster-Like Effects Inventory" with an interval-level of measurement ($M = 50$ and $SD = 10$). Table 4 gives the translation of raw sums (using 0 vs 1 for No vs Yes, respectively) to Rasch scaled scores, together with the scaled scores' standard errors of estimate (*SE*) and the percentage of respondents for each raw score. The median raw sum score is 1 approximately as most respondents reported 0 or 1 anomalous events. Thus, the distribution has a strong positive skew. While a higher median is desirable, we offer this new measure as a methodological advance to support future research on trickster-like phenomena in the context of scholarly documentation.

CONFRONTING TRICKSTER DYNAMICS

Our results suggest that Massullo et al.'s (2025a) "mysteriously appearing" text is not an isolated event but rather indicative of a larger mosaic of associated manifestations. Table 5 further implies that many trickster-like experiences—including document-related anomalies or unexpected disruptions while writing about ghostly episodes—often can be understood as context-sensitive psychological reactions involving cognitive bias, memory distortion, attentional priming, absorption-dissociation, or the misattribution of coincidence. Indeed, the Rasch estimates in Table 2 ostensibly map onto the real-world error dynamics in Table 1 in interesting ways, though the correspondences are illustrative versus exact.

The lowest-difficulty trickster experiences (e.g., narrative lapses or fleeting perceptual slips) occur most often, loosely paralleling the high-frequency, low-impact errors tabulated for published papers (e.g., typographical or formatting mistakes; minor citation inaccuracies). Mid-range Logits—reflecting subtler cognitive-environmental anomalies such as audio distortions or temporo-emotional shifts—qualitatively resemble common methodological or analytical oversights (e.g., statistical reporting errors; quotation inaccuracies; significant-figure misuse). At the upper tier of the hierarchy, rarer trickster effects (e.g., persistent computer malfunctions) occupy thresholds analogous to infrequent but more severe publication failures—such as inappropriate image duplication (~3.8%) (Bik et al., 2016), plagiarism among retracted articles (9.8%) and duplicate publication (or self-plagiarism) (14.2%) (Fang et al., 2012).

Note that Tables 1 and 2 should not be compared directly. For instance, Table 1's "Plagiarism" and "Duplicate Publication" estimates derive from analyses of retracted papers rather than of all published articles, and the percentages in Table 1 span multiple disciplines and error type. By contrast, the Logit values in Table 2 represent scaled probabilities from the current survey. Accordingly, Logits should not be compared to prevalence rates. Rather than implying direct quantitative equivalence, this cross-walk serves as a heuristic: more improbable trickster experiences tend to align with thresholds occupied by progressively rarer

Table 3. Summary of Response Bias (DIF) and Main Effects.

		DIF		*M* difference
DIF Factor	**Groups**	**No of items with DIF > 0.5 & < .01**	**Item (Logits)**	**(Logits)**
Gender	Men - Women	1	4. Audio distorted (1.65 Logits)	0.13*
Age	Older - Younger	0	-	−0.52*
Group	Amateur - Scientist	0	-	0.68*
Cognitive Check	Yes - No	0		−0.97**

Note: * $p < .05$, ** $p < .02$.

and more consequential publication errors. Future investigations could strengthen this comparison by calibrating Rasch thresholds against error-type prevalences drawn from the same corpus or by developing a unified scale that explicitly maps anomaly probabilities onto publication-error rates.

We suggest that the perceived anomalous quality of these trickster experiences might be fueled in part by emotionally charged or liminal writing environments, especially when dealing with paranormal themes. Moreover, these processes often operate outside conscious awareness (Bargh & Chartrand, 1999), which explains why their effects can feel spontaneous, surprising, or externally generated—even though they stem from normal cognitive functioning shaped by the contextual demands of the paranormal domain. For example, one of the most pervasive mechanisms is reconstructive memory. Authors naturally impose narrative structure, causal links, and dramatic emphasis onto their experiences—often unconsciously—leading to selective editing, omission, or embellishment (Bruner, 1993). Drinkwater et al. (2019) directly spoke to these and other psychosocial influences in their VAPUS (i.e., Versatility, Adaptability, Participatory, Universality, and Scalability) model of ghost narratives. These changes are not typically experienced as falsifications but rather as truthful representations that *feel* accurate. When discrepancies are later discovered—by the author or others—they may appear anomalous or mysteriously inserted, reinforcing a trickster-like impression.

Metacognitive blind spots can further complicate this process. People frequently overestimate the accuracy and coherence of their memories and writing, especially under emotionally arousing or cognitively taxing conditions (Koriat, 2007). As a result, inconsistencies or subtle errors may go undetected until much later. When these lapses surface, they seem to lack a clear origin—appearing inexplicable or "externalized." A closely related explanation is source monitoring error, which occurs when individuals

Table 4. Raw sum-to-Rasch Scaled Score Conversion Table for the Trickster-Like Experiences Inventory (M = 50, SD = 10).

Raw Sum	Rasch Score	*SE*	Freq %
0	40	10.4	38.9
1	47	5.9	13.2
2	52	4.4	13.2
3	55	3.8	9.6
4	57	3.4	6.0
5	59	3.3	4.2
6	61	3.2	3.0
7	63	3.1	3.0
8	65	3.2	1.8
9	66	3.3	1.8
10	68	3.5	1.2
11	71	3.8	1.2
12	74	4.4	1.2
13	78	5.9	0.6
14	85	10.4	1.2

Table 5. Conventional Explanations for Trickster Experiences in Writing Contexts.

Trickster-like Experience	Potential Psychological Explanation	Reference
Erratic computer behavior	Expectancy bias; attention bias; misattributed coincidence	(Koriat, 2007; Risen, 2016)
Missing or misplaced files	Inattentional error; dissociation; confirmation bias.	(Lynn et al., 2008; Sweller, 1988)
Text altered without intent	Autosave/version confusion; source monitoring errors; memory distortion.	(Johnson et al., 1993; Lynn et al., 2008)
Audio files distorted	Device limitations; attentional bias; selective perception during playback.	(French & Stone, 2013; Lange & Houran, 2001)
Devices acting strangely	Priming effects; salience of ambiguous stimuli; attribution error.	(Bargh & Chartrand, 1999; Brugger, 2001)
Saved work vanished	Cognitive overload; dissociation; misperceived user error.	(Lynn et al., 2008; Reason, 1990)
Coincidences during writing	Apophenia; attentional priming; probability neglect.	(Brugger, 2001; Koriat, 2007)
Sensed presence in room	Absorption; heightened suggestibility; priming.	(Blanke et al., 2004; Persinger, 2001)
Thematic or vivid dreams	Emotional carryover; REM intrusion; thematic salience in dream content.	(Domhoff, 2001; Lynn et al., 2008)
Time felt distorted	Flow state; absorption; altered time perception due to arousal or focus.	(Csikszentmihalyi, 1990; Eagleman, 2008)
Emotion shifts while writing	Emotional contagion; cognitive-affective resonance with material; arousal effects.	(Bruner, 1993; Lynn et al., 2008)
Unexplained physical sensations	Psychosomatic response; autonomic activation.	(Bargh & Chartrand, 1999; Houran et al., 2002a)
Device malfunctions nearby	Expectancy bias; chance events.	(Kaptchuk, 2002; Lange & Houran, 2001)
Others sensed odd events	Environmental suggestion; shared attentional focus; emotional contagion.	(Asma, 2009; Houran & Lange, 1996)
Strong pull or aversion to topic	Emotional salience; cognitive dissonance; absorption; arousal-biased memory encoding.	(Bruner, 1993; Lynn et al., 2008)

misattribute the origin of a memory, e.g., mistaking something imagined or inferred for something directly experienced (Johnson et al., 1993). Given that paranormal investigations often involve imagination, suggestion, and ambiguous stimuli, the stage is set for false recollections that feel authentic but are in fact narrative constructions. These distortions remain invisible to the writer until reencountered as oddities. Priming and expectancy effects are also highly relevant. When researchers anticipate anomalies—or have internalized the trickster motif as a guiding narrative—they may unknowingly attend more to irregularities, overlook mundane explanations, or remember ordinary disruptions (e.g., lost files, technical glitches) as paranormally significant (cf. Bargh & Chartrand, 1999; Drinkwater et al., 2019). These effects operate automatically and shape both perception and memory without conscious intent.

Another plausible common mechanism is cognitive load. Writing about complex, ambiguous, or emotionally intense phenomena—such as hauntings or poltergeist activity—might overload working memory and reduce attentional bandwidth (Sweller, 1988). This would increase the likelihood of unnoticed omissions, contradictions, or disjointed narrative flow. Such shortfalls often mirror the memory disruptions reported in individuals with elevated transliminality. Dissociative-type experiences, including psychological absorption and compartmentalization, can further contribute to these disruptions. Under conditions of emotional arousal, overstimulation, or fatigue—not uncommon states during field investigations or periods of reflective writing—authors may encode memories in a fragmented or discontinuous manner (Lynn et al., 2008). These disjunctions can later seem uncanny or intrusive when encountered during report review.

Importantly, while many trickster experiences might be explained via established psychological principles, their convergence in emotionally charged and meaning-rich contexts raises intriguing questions. In some cases, trickster phenomena may hint at unknown mediators or moderators, including potential parapsychological factors not yet fully understood. One key consideration here are contagion effects—i.e., clustered or snowballed perceptions—as exemplified by percipients who experience an increase in *S/O* phenomena following a prior anomalous experience (Appelle et al., 2000; Greyson, 1983; Lange & Houran, 2021). For instance, the Psychic Opening hypothesis asserts that spiritual emergencies (i.e., temporary psychological crises sparked by overwhelming spiritual experiences that can lead to deep personal transformation) can trigger a sudden or intensified emergence of psi abilities (e.g., Storm & Goretzki, 2020, 2021). Other authors argue that biological correlates of anomalous-altered experiences are mediators not etiologies of transpersonal modes of perception (e.g., Woollacott & Weiler, 2025).

But germane to this paper, contagion also could involve so-called "error chains." This term denotes situations in which one initial slip or lapse triggers a cascade of subsequent failures, magnifying risk and often precipitating more serious consequences (Reason, 1990). In complex systems—whether in aviation, healthcare, or everyday tasks—latent vulnerabilities align with active errors in what Reason (1997) famously described as the "Swiss cheese" model, i.e., holes in multiple defenses line up, allowing a single mistake to perforate all safeguards. Psychological research has unpacked key mechanisms driving error propagation. For instance, unintended actions such as slips and lapses often arise from attentional breakdowns or overreliance on automatic routines; if undetected, they impose extra cognitive load, undermining monitoring processes and increasing the odds of further errors (Norman, 1981).

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Our preliminary findings must be interpreted with caution. Most notably, our use of the trickster moniker could be criticized for being overly broad and imprecise. That is, branding every odd event or disruption in academic writing as a "trickster experience" might risk diluting the concept into a vague, catch-all label. The survey's explicit framing along these lines may have further attracted respondents predisposed to the trickster concept or fueled confirmation bias with the *S/O* phenomena, potentially inflating endorsement rates and limiting generalizability (Tourangeau et al., 2000). The over-reporting of certain perceptions or symptoms is a well-known confound in many areas of social scientific and biomedical research, and notably in the context of non-ordinary experiences (Lange et al., 2019; Maraldi, 2020; Merckelbach et al., 2017). Conversely, those who found the trickster term irrelevant or pejorative may have opted out, introducing a degree of selection bias.

Respondents also did not specify the full context, frequency, or disruptiveness level of their anomalous experiences, and we did not assess relevant perceptual-personality variables such as transliminality (Evans et al., 2019), paranormal belief (Dean et al., 2022), ambiguity tolerance (Houran & Williams, 1998), or aberrant

salience (Irwin et al., 2014)—all of which are likely to modulate perception or attribution. For instance, higher transliminality correlates with aberrations in short-term memory (Houran & Thalbourne, 2003) and proneness to cognitive load (Evans et al., 2019). Future studies should therefore examine these and other potential covariates to clarify the role of individual differences. Likewise, the emotional strain and liminality inherent in writing about anomalous phenomena may itself generate both routine errors and vivid subjective experiences; distinguishing liminality-driven effects from any distinct "trickster" dynamic is therefore a key goal for future comparative research.

Although our survey built in some controls (i.e., cognitive self-check scores and credentialed vs citizen scientist groups), we did not compare trickster experiences across paranormal versus non-paranormal writing contexts or sample a wider array of comparison groups (cf. Houran, 1997; Houran & Brugger, 2000; Schumacher et al., 2023). Other types of topics or liminal creative fields as reviewed in the Introduction might also be similarly conducive for anomalies or disruptions. Specifically, ethnographic memoirs, trauma narratives, or creative nonfiction might also bring about trickster experiences, such as missing archival documents in oral histories or unexplained emotional leaps in memoir drafts. Focused cross-disciplinary applications would therefore be beneficial for testing the TEI's robustness and revealing whether the hypothesized dynamics are universal across immersive writing types.

Education and expertise may further shape how investigators interact with trickster dynamics. Novices may overattribute anomalies due to inexperience, while experts may rationalize biases through narrative overfitting or resistance to disconfirming evidence (Kennedy, 2024). This suggests that expertise may promote rather than eliminate certain cognitive distortions. Table 6 outlines additional variables—such as emotional investment, disciplinary norms, and collaboration dynamics—that warrant systematic investigation. Fresh studies might also explore if these effects manifest only in the field versus the office or otherwise exhibit different Rasch hierarchies across various settings similar to Houran et al. (2019a) who found distinct "haunt hierarchies" for *S/O* phenomena reported under spontaneous, primed, lifestyle, fantasy, and deceptive reporting conditions.

Similarly, the view that "liminality" is anti-structure (e.g., Hansen, 2001; McMahon, 1998) might predict that the frequency or intensity of anomalous trickster experiences (as measured by TEI scores) will increase in more rigidly controlled research or writing protocols. And lastly, the Rasch hierarchy of trickster phenomena might differ when considering an investigator's lived experience during single research or writing project versus an investigator's lifetime inventory of such experiences when writing about the paranormal. We likewise recommend that future studies, in addition to measuring the individual differences noted above, also assess for researchers' psi-conducive or inhibitory dispositions to flag potential experimenter-psi effects (e.g., Parker, 2013; Smith, 2003).

Despite these limitations, exploratory surveys like ours offer strategic benefits. They can reveal directionality, establish potential effect sizes, test recruitment feasibility, and generate foundational data for instrument refinement and hypothesis development (Leon et al., 2011). Our TEI, though preliminary, provides a promising metric for quantifying trickster-like anomalies that are reported within certain contexts. Future work should test its comprehensiveness and applicability across varied writing or related environments to sharpen its reliability and theoretical grounding.

The Rasch-based alignment with known publication errors is illustrative rather than definitive, but it affords a starting heuristic for contextualizing some trickster-like experiences. Because genuinely anomalous "trickster" events are likely rare and heterogeneous, our one-factor Rasch solution may instead be capturing the more common variance of routine errors—carelessness, attentional lapses, or normal memory distortions. Thus, studies should explore multi-factor solutions (e.g., separate "Error" vs. "Anomalous" subscales) to check for a distinct parapsychological component after accounting for the probable occurrence of ordinary mistakes. Yet, the trickster-like experiences considered in this study were not independent but rather predictably interrelated irrespective of researcher Age, Gender, or Type. Trickster dynamics therefore might involve a systematic phenomenon of escalating anomalies or disruptions—what we call a "trickster chain" —whatever its underlying cause(s). This speculative idea is explored further in the Discussion section below.

Finally, future studies should also examine whether the kinds of trickster experiences considered here coincide with transpersonal indicators—such as mystical-type experiences, ego dissolution, or heightened compassion—and whether such clusters predict lasting shifts in worldview or self-identity. These research outcomes would clarify whether certain disruptions function purely as cognitive noise or as liminal openings consistent with processes of spiritual emergence (Grof & Grof, 1989), shadow integration, or other transformative pathways recognized in

Table 6. Future Research Questions About Trickster Experiences in Academic Publishing.

Variable	Guiding Question	Rationale	Reference
Age of Investigator	Does age correlate with susceptibility to narrative distortion or memory confounds in scholarly writing?	Explores whether cognitive aging influences source monitoring or embellishment tendencies.	(Zacks et al., 2000)
Writing Expertise	How does writing proficiency affect the clarity, accuracy, and susceptibility to trickster-like effects?	Assesses whether skilled writers are better at avoiding bias—or more adept at masking it.	(Kellogg, 2008)
Disciplinary Norms	Do publication conventions in different academic fields foster or suppress trickster effects?	Investigates how disciplinary expectations shape narrative framing and data presentation.	(Becher & Trowler, 2001)
Emotional Investment	How does personal attachment to a topic influence selective reporting or interpretive bias?	Examines the role of affective involvement in distorting scholarly objectivity.	(Kunda, 1990)
Career Stage	Are early-career researchers more prone to trickster effects due to pressure or inexperience?	Evaluates how professional incentives and expertise levels interact with cognitive bias.	(van Dalen & Henkens, 2012)
Publication Pressure	Does the pressure to publish novel findings increase the likelihood of narrative embellishment?	Investigates systemic drivers of distortion in academic storytelling.	(Fanelli, 2010)
Cognitive Style	Do individual differences in cognitive style (e.g., intuitive vs. analytical) predict trickster susceptibility?	Explores psychological predispositions that may shape how data are interpreted and reported.	(Epstein et al., 1996)
Collaboration Dynamics	How do team-based writing processes influence the emergence or suppression of trickster effects?	Assesses whether collaborative authorship mitigates or amplifies bias through group dynamics.	(Wuchty et al., 2007)
Experimenter - Psi Profile	Can a researcher's psi-conducive/inhibitory profile predict trickster chain intensity?	Tests whether individual writer dispositions drive documented anomalies beyond human error.	(Parker, 2013)

transpersonal psychology. Such a program would allow the TEI to serve not only as a metric of anomaly and disruption but as a potential tool for mapping transformative potential in liminal research contexts. The measure is therefore freely accessible for researchers to incorporate into future studies, provided appropriate attribution is given.

DISCUSSION

We have no independent, empirical indicators to suggest that the phantom "Watt et al. (2015)" citation is anything other than an untraced author error (Massullo et al., 2025b). Such mistakes are ubiquitous in academic writing but rarely undermine scientific validity, as journals routinely publish *errata* (concerning production errors) and *corrigenda* (concerning author errors) to correct the record. Authors can still significantly reduce the final error count via careful preparation and proofreading, ideally by multiple reviewers, and AI-powered editing tools. Houran and Laythe (2024) further outlined seven author strategies to support more efficient and accurate scientific publishing. Yet, author or production mistakes alone might not explain for all trickster phenomena. Some researchers have even proposed transpersonal aspects of scholarly or occupational activities (e.g., Anderson, 2015; Anderson & Braud, 2011; Bache, 2025; Braud, 1998; White, 1998), perhaps hinting that certain cognitive or environmental conditions can occasionally foster parapsychological outcomes. One survey participant's experience possibly underscores this idea:

> Only one odd thing happened to me (it was indeed quite odd and remains so)…thus I only checked one box as 'true.' It's very simply that during or perhaps just after some writing I did a year or so ago, my author's copy of a book I wrote (which I had referenced) outright disappeared. I know precisely where I placed it, and it wasn't there—nor has it been found anywhere else after a year (personal communication to J. Houran, 14 July 2025).

This account eerily resembles commentary by Arthur B. Myers (1917–2006)—a prolific American author, journalist, and investigative reporter known for his deep interest in the paranormal—who wrote in one of his introductions:

> Whenever I write these books…psychic things start happening around me. My notes disappear and then reappear, a film roll disappears from plain sight never to appear again, strange things happen to tape recordings while I'm interviewing people. Sometimes their voices don't appear on the tapes, or mine doesn't, or the talk is all backwards. Now I'm having problems with photos… Now why should this happen? I had not touched the camera's adjustments. All the photos on the roll were taken under the same conditions, outside in bright sunlight. I think spooks were gumming up the works…Oddly enough, when I finish a book

> on the parapsychological and start working on more mundane projects, these things quiet down (Myers, 1990, pp. xi–xii).

But regardless of their underlying sources or mechanisms, our study offers the first systematic quantification of trickster-like experiences that occur when researchers write about ghostly episodes. It is unfortunate that it has taken this long for any research to address the observations and insights from Houran and Brugger's (2000) original commentary and proposals in this area. Curiously, those two authors also experienced several unexpected computer crashes during the preparation of their own paper (cf. Footnote 2, p. 40). The present participants, on the other hand, reported a broader spectrum of *S/O* anomalies and disruptions, and Rasch analysis indicated that 14 of the 15 items cohere on a unidimensional continuum, exhibiting high person and item reliability with only one modest gender-related DIF. These findings support the TEI's construct validity and highlight its viability as a measurement tool for both parapsychological and non-parapsychological research contexts.

The trickster framing spotlights the mysterious, though most anomalies align with established cognitive processes. Memory reconstruction and source-monitoring errors can explain phantom citations, while attentional biases, priming, and cognitive load account for misplaced files, text alterations, and perceived device malfunctions (Johnson et al., 1993; Lange & Houran, 2001). Casting these lapses through a trickster metaphor underscores the epistemological vulnerabilities researchers face under ambiguity, uncertainty, and heightened expectation or emotional arousal. The dynamic and socially charged nature of ghost-related narratives (Eaton, 2019; Hill et al., 2018; Ironside, 2024) may amplify these cognitive-environmental interactions. Emotional investment, shared expectancy, and narrative reconstruction can collectively engender experiences that feel externally driven yet arise from normal perceptual or memory processes. Thus, many trickster phenomena probably emerge from the confluence of psychological predispositions, environmental ambiguity, and the immersive-like storytelling demands of parapsychological writing.

Practically, our results imply that some trickster-like experiences comprise a single, underlying construct. This conceptually replicates previous one-factor (Rasch) solutions found for *S/O* phenomena commonly reported in ghostly episodes (Houran & Lange, 2001; Houran et al., 2002b, 2019a). Therefore, researchers would seem to be contending with a general trickster *dynamic* as opposed to discrete *experiences* per se. Kennedy (2024) might nonetheless remind us that any statistical hierarchy is only as useful as the underlying theory that grounds it. As such, before positing a single trait, we must first develop explicit, falsifiable models of the cognitive and motivational processes—rather than a catch-all "trickster force"—that tie those experiences together. That said, to mitigate inadvertent cognitive confounds, investigators should adopt rigorous documentation practices—systematic proofreading protocols, independent cross-checks, and, where feasible, blinded control conditions—to distinguish routine memory or attention lapses from genuinely unexplained anomalies. Studying trickster dynamics in research and reporting contexts therefore enriches our understanding of human behavior under conditions of ambiguity, emotional arousal, or symbolic resonance.

The robust clustering of *S/O* anomalies somewhat mirrors the hitchhiker or contagion effects discussed by other authors. From a parsimonious standpoint, an initial glitch—such as a missing file—heightens vigilance and expectancy, might trigger an error- or trickster-chain in which each subsequent lapse validates the paranormal narrative and primes further lapses under cognitive load (e.g., Norman, 1981; Reason, 1990). From this viewpoint, contagion effects reflect the metacognitive artifacts of trickster dynamics rather than a trans-contextual paranormal process. Illustratively, Matthews (1997) noted that if a shopper faces *N* checkout lines, the chance of picking the slowest is exactly 1/*N*, and that the narrow "Murphy Zones" on maps—along edges and folds—paradoxically cover more than half the total area despite their slim appearance.

In the same way, the proffered trickster chain model perhaps suggests that minor writing anomalies or disruptions (e.g., lost files, themed dreams) predictably accumulate under cognitive load according to simple probabilistic and dynamical laws—producing a sequence of events that feels mischievous but is, in fact, mathematically foreseeable. Nevertheless, non-ordinary mechanisms remain a tantalizing possibility. Lange and Houran's (2021; cf. Houran et al., 2024; Lange et al., 2023) idea of an enchantment–psi loop suggests that a solitary, but salient, anomalous event can instigate a self-reinforcing cycle of heightened transliminality and further psi-conducive states, eliciting successive anomalous experiences.

Our "trickster chain" concept aims to describe the patterned sequence of *S/O* anomalies that unfold during the process of writing about paranormal topics. Unlike

expectancy chains, which are primarily driven by suggestion and cognitive priming (Bargh & Chartrand, 1999; Drinkwater et al., 2019), or paranormal contagion effects, which involve the apparent transference of anomalous phenomena across time or location (Knapp & Kelleher, 2005; McCue, 2022), trickster chains are marked by their disruptive ambiguity and apparent escalation in intensity or improbability. We hypothesize that these sequences often begin with a low-threshold anomaly or disruption—such as narrative lapses, emotional agitation, or vivid dreams—that sensitizes the researcher's attentional field and primes a heightened receptivity to further anomalies (cf. Koriat, 2007; Lange & Houran, 2021). Subsequent events may include increasingly concrete disruptions (e.g., missing files, equipment malfunctions) that seem disproportionate to situational factors and resist clear attribution.

Hill et al.'s (2018) VAPUS model further provides an explanatory bridge to these cascading sequences. In particular, some of the present trickster effects might exemplify the Participatory Nature of ghost narratives. These low-threshold, ambiguous disruptions—vivid dreams, coincidences, and sudden emotional shifts—act as participatory cues that recruit the writer's attention and invite interpretive engagement, thereby reinforcing narrative salience; the model's elements of Versatility and Adaptability explain how these subjective cues map easily onto existing cultural templates and are reshaped to fit differing audiences and media, increasing their transmissibility. Scalability amplifies small, locally experienced anomalies into wider contagion chains through sharing, revision, and social retelling, while Universality makes such signals broadly resonant across diverse readers and investigators, which in turn biases source monitoring and expectancy during drafting and review. Together, these VAPUS dynamics clarify how routine cognitive-environmental processes can become self-reinforcing narrative engines that both produce and legitimize trickster-like sequences in paranormal writing.

From a transpersonal perspective, such escalating sequences also could be viewed as liminal process dynamics in which destabilization precedes integration. Comparable patterns are described in spiritual emergency models (Grof & Grof, 1989) and in archetypal psychology, where the trickster signals a confrontation with shadow material and a potential reorganization of consciousness. In these frameworks, *S/O* anomalies are not merely malfunctions or cognitive errors but may function as symbolic enactments of inner transformation—catalyzed by the thematic and emotional intensity of the writing process itself. Some trickster chains may reflect normal psychological mechanisms such as source-monitoring errors (Johnson et al., 1993) or cognitive load (Sweller, 1988), but others could be embedded within a "liminal cognitive ecology," i.e., a destabilized meaning-making space in which *S/O* disruptions converge and amplify. In this context, trickster chains blur the distinction between artifact and anomaly, and may reflect recursive feedback between belief, environment, and the emotionally charged act of paranormal narration. Recognizing and systematically measuring these ostensible chains, as enabled by our TEI measure, offers a novel framework for understanding the epistemic fragility and symbolic dynamics that can emerge in contexts of documenting topics of high-strangeness (Hansen, 2001; Kennedy, 2024; Storm, 2023). The tool serves as a structured springboard for mapping writing-related anomalies, but we do not treat it yet as a fully validated measure of trickster dynamics. Instead, it is a starting point for qualitative interviews, cross-discipline comparisons, and further psychometric testing.

Should some hitchhiker or contagion-like patterns indeed persist in tightly controlled settings—or align consistently with psychophysiological markers—this could bolster an anomalous interpretation. Future work should incorporate temporal diaries, randomized control conditions, and psychophysiological monitoring to disentangle expectancy-driven error chains from putative psi-related contagion effects, thereby advancing both methodological rigor and our understanding of trickster-like experiences. Such controls also can be supplemented with forensic parapsychology methods. The psi-source diagnostics outlined by Parker (2013) might help to disentangle writer-generated anomalies from genuine text-based disruptions, reinforcing double-blind cross-checks. We are actively scoping out research protocols along these lines and likewise encourage other investigators to pursue similar efforts. In this way, we might discover consistent support for adding the trickster phenomena outlined here to the comprehensive inventories of haunt-type anomalies published by Dullin (2024) and Houran and colleagues (Houran et al., 2019a, 2019b).

Interpreting unexpected disruptions through the trickster archetype sharpens our awareness of epistemological fragility across qualitative and experiential fields. Narratives in ethnography, trauma studies, and parapsychology often unfold nonlinearly or fragmentedly, underscoring the need for methodological reflexivity and safeguards against overconfidence in report coherence (Drinkwater et al., 2019; Koriat, 2007; Lincoln & Guba, 1985). Rather than

dismiss paradox or resistance as "noise," the trickster motif invites researchers to treat such disruptions and anomalies as diagnostic markers of deeper complexities in knowledge construction. Trickster-like events thus serve as a powerful lens for metascience, highlighting observer influence, paradigm limits, and the provisional nature of scientific claims (see e.g., Heisenberg, 1930/1983; Rosenthal, 1966).

Modeling trickster-like experiences within a Rasch (1960/1980) framework transforms fleeting anecdotes into quantifiable phenomena and delivers the first empirical model and associated tool for probing *S/O* anomalies (or artifacts) that manifest when researchers write under liminal conditions, such as describing ghostly episodes or related topics. The TEI tool therefore paves the way for diary-based, blinded, and psychophysiological investigations that can help to tease apart conventional error chains from potentially parapsychological-rooted contagion effects. In Kennedy's (2024) view, the psi-trickster is not simply an experimental nuisance but a signal that our standard assumptions are insufficient. Accordingly, the trickster is perhaps more than a confound to be managed; it is also a potential teacher inviting deeper reflexivity and transformation.

Transpersonal and clinical parapsychological approaches thus encourage us to meet such moments with both methodological discipline and openness to the possibility that the very act of inquiry can alter the consciousness of the inquirer. In this sense, experimenters themselves may unwittingly act as tricksters. Embracing the trickster archetype as a diagnostic lens likewise reminds researchers to adopt rigorous proofreading, independent cross-checks, and transparent reporting; practices that sharpen epistemic humility and reinforce the provisional nature of scientific activities and claims. Accordingly, we can deepen our understanding of the challenges and paradoxes at science's fringes and chart a more robust, replicable path forward for exploring the unknown—as well as whatever forces or dynamics might happen to interfere with this endeavor.

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END NOTES

1 The phantom citation was: "Watt, C., Wiseman, R., & Tierney, I. (2015). Paranormal belief and perceptions of deceptive behavior. *Frontiers in Psychology*, *6*, Article 1516. https://doi.org/10.3389/fpsyg.2015.01516." Massullo et al. (2025b) also corrected six other untraced citation errors, though none affected the scientific the scientific conclusions of their article.

2 Item 3 (#) is retained for use in future research, though currently it is not scored.

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APPENDIX

"TRICKSTER-LIKE EXPERIENCES" SURVEY – WRITING ABOUT THE PARANORMAL[2]

Instructions: Please indicate whether any the following events have happened to you while writing research reports or books, or otherwise preparing written work specifically related to ghosts, hauntings, poltergeists, or any similar encounter-type experiences. Mark all that apply.

Mark "True" if the event happened to you at least once in a memorable or unusual way; otherwise, mark "False":

1. O: My computer or word processing program has acted erratically in ways that seemed unexplainable while working on such topics.
2. O: Files, notes, or key reference materials have gone missing or appeared misplaced without logical explanation during the writing process.
3. O: Written text in a document has disappeared, altered, or reappeared without my conscious intent.
4. O: Audio recordings, drafts, or voice memos related to the writing have been corrupted or contained unexpected distortions.
5. O: I experienced interruptions from devices (e.g., printers, phones, lights) behaving oddly or turning on/off while engaged in writing.
6. O: Completed work has failed to save or mysteriously vanished despite following standard precautions.
7. S: I've encountered meaningful coincidences (e.g., strange noises, relevant media playing) that occurred exactly as I was writing specific content.
8. S: I've felt as though an unseen presence was observing, influencing, or interfering with the writing process.
9. S: While writing about ghosts, haunts, or poltergeists, I experienced unusual sleep patterns or vivid, disturbing, or thematically related dreams.
10. S: I've noticed time distortions (e.g., lost time, time passing unusually quickly or slowly) while working on these topics.
11. S: I've felt emotionally unsettled (e.g., anxious, irritable, inexplicably euphoric) in ways that seemed connected to the writing process.
12. S: I've experienced physical sensations (e.g., chills, pressure, tingling) without clear cause while writing about these subjects.
13. O: Electrical or mechanical devices near me (e.g., lights, speakers, monitors) have malfunctioned or behaved unusually during writing sessions.
14. S: Others in my environment (e.g., housemates, family members) reported odd experiences while I was actively engaged with the material.
15. S: I've felt unusually drawn to or repelled by the material in a way that felt beyond ordinary interest or discomfort.

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RESEARCH ARTICLE

Can Consciousness Nudge Randomness?

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ABSTRACT

This paper presents the Cognitive Entropy Shift Model (CESM), a structured framework for exploring how distinct cognitive states, specifically passive emotional attention and goal-directed intention may influence probabilistic systems by reducing entropy. Drawing on principles from information theory and Bayesian-inspired probability updating, CESM conceptualizes consciousness as an informational constraint capable of subtly biasing outcomes in systems typically governed by randomness. To evaluate this framework, a two-year empirical study was conducted under controlled conditions using data from a physical random number generator (RNG). CESM was used to predict when deviations from randomness would occur and the analysis revealed statistically significant deviations ($t = -4.347$, $p < 0.001$) during periods characterized by heightened emotional attention, with effect sizes in the range of 0.5–0.7%. These results aligned closely with CESM's predictions. The effect also diminished with increasing spatial distance from the presumed source of influence, highlighting proximity as a potentially critical factor. In addition to presenting new empirical results, this paper also applies CESM retrospectively to earlier studies, offering a clear and testable reinterpretation of previously reported anomalies. By distinguishing between passive and active forms of cognitive engagement, and embedding them within a quantifiable statistical model, CESM provides a structured approach for examining whether, and under what conditions, cognitive states may correspond to subtle deviations in probabilities. The findings encourage further exploration into how consciousness relates to information, including potential effects across spatial distance, within a framework that supports formal, testable hypotheses in advance of data collection, while remaining grounded in established scientific principles.

KEYWORDS

Consciousness, Entropy, Information Theory, Bayesian Updating, Cognitive States.

INTRODUCTION

The idea that human consciousness might influence the physical world has fascinated philosophers for centuries. Thinkers such as Plato (ca. 375 BCE/2007), with his theory of ideal forms, Descartes and Williams (1641/1996), with his concept of mind–body dualism, and Spinoza (1677/n.d), who proposed that mind and matter are two aspects of the same substance, all wrestled with this question. In more recent times, science has taken up this debate, transforming

it into a testable empirical question. Thanks to advances in physics, neuroscience, and information theory, researchers now have new tools to explore the relationship between consciousness and the physical world.

Modern scientific investigations into the relationship between consciousness and physical systems have taken steps forward, as developments in quantum mechanics, cognitive science, and information theory have yielded new insights. In the quantum realm, classical assumptions about determinism have been challenged by interpretations from Wigner and Stapp, which suggest that observation and (potentially) consciousness may play a critical role in shaping physical states (Stapp, 2001; Wigner, 1961). Similarly, Quantum Bayesianism (QBism) proposes that probabilities in quantum mechanics are observer-dependent constructs, offering additional perspectives on the role of consciousness (Fuchs & Schack, 2013). This perspective has sparked ongoing debate over whether consciousness is merely an emergent byproduct of neural activity, or whether it represents a more fundamental aspect of nature, potentially acting as an intrinsic factor in driving the collapse of the wavefunction.

Meanwhile, cognitive neuroscience has made notable progress in identifying the neural correlates of consciousness. Early models explored mechanisms such as sensorimotor integration and neural synchrony (Cotterill, 2001; Llinás & Ribary, 2001), while later frameworks focused on global information broadcasting within the brain's fronto-parietal circuits (Baars, 1997; Koch, 2004). Two of the most prominent contemporary theories, Global Neuronal Workspace Theory and Integrated Information Theory (Tononi, 2004), have recently been subjected to large-scale empirical testing with mixed results as some of their predictions have been supported, while others have been challenged by experimental data (Cogitate Consortium et al., 2025).

Alongside these mainstream models, alternative perspectives continue to broaden the theoretical landscape. Quantum-based accounts, such as the Orchestrated Objective Reduction (Orch OR) theory, propose that consciousness arises from orchestrated quantum state reductions in neuronal microtubules (Hameroff & Penrose, 1996) and have since been further refined into a comprehensive framework integrating neurophysiology and fundamental physics (Hameroff & Penrose, 2016). In parallel, emerging clinical perspectives question whether full sentience requires cortical involvement at all (Kawkabani & Kaut, 2024).

Despite this progress, a fundamental explanatory gap remains between measurable brain activity and the qualitative nature of subjective experience. This enduring limitation, which has been famously termed the "hard problem of consciousness" (Chalmers, 1995), has fueled the search for alternative frameworks that challenge strictly reductionist explanations of the mind. Taken together, these developments underscore the importance of broadening our theoretical perspectives.

One way to deepen our understanding of consciousness is to consider it fundamentally involved in the organization of information. Information theory, originally developed by Shannon (1948), offers a framework for quantifying uncertainty and understanding how constraints can reduce entropy. Although first applied to telecommunications, these principles have since been extended to broader models explaining how order can emerge from randomness when specific constraints are applied.

Building on this insight, consciousness can be viewed as an informational constraint: cognitive processes shape what might otherwise be random input into structured and meaningful patterns. This perspective aligns with the Bayesian brain model, which suggests that the mind actively reduces uncertainty by continuously updating its internal representations based on predictive information. In this process, consciousness functions as an internal organizer, guiding perception, memory, and attention by generating probabilistic representations of reality from incoming sensory input (Clark, 2015; Friston, 2010; Seth & Bayne, 2022).

Despite these advancements, mainstream science continues to grapple with several unresolved aspects of conscious experience. These include the origin of subjectivity (Nagel, 1974), the integration of perception across the brain's modular systems (Revonsuo, 1999), the perceived continuity of conscious experience over time (Pöppel, 2004; Varela, 1999), and the basis of self-awareness (Gallagher & Zahavi, 2008; Metzinger, 2004). While significant theoretical and empirical progress has been made, most scientific models treat consciousness as a byproduct of neural computation, offering limited explanations for how or why these phenomena arise (Churchland, 1997; Dennett, 1991).

This raises a broader question: could consciousness do more than interpret information internally? If it plays an active role in reducing uncertainty within the brain, as suggested by the Bayesian brain model, it is worth asking whether this organizing function might also extend beyond the internal domain. Could cognitive states that shape perception and expectation, goal oriented or otherwise, also leave subtle yet systematic traces in external processes

that are otherwise considered random? This is not only a theoretical question; it is one that can be addressed empirically.

Random number generators (RNGs), which produce high-entropy and inherently unpredictable outputs, offer a well-controlled setting for investigating whether cognitive states can measurably influence external randomness. This was explored in the late 1960s and 1970s by Helmut Schmidt, who conducted experiments testing whether the mind could influence probabilistic outcomes. He used electronic random number generators based on noise diodes or radioactive decay and found results suggesting that focused mental activity could indeed influence the behavior of random systems (Schmidt, 1969, 1970, 1973). Building on this early work, the Princeton Engineering Anomalies Research (PEAR) Laboratory provided more extensive support for the hypothesis that consciousness might influence randomness. Researchers there found that focused human intention could produce small but statistically significant deviations in RNG output beyond chance expectations (Jahn & Dunne, 1987; Jahn et al., 1997; Jahn & Dunne, 2005), suggesting that consciousness may interact with a shared informational substrate that extends beyond individual subjective experience. Extending the PEAR lab's findings, the Global Consciousness Project (GCP) investigated whether collective consciousness might produce similar effects on a global scale. The project analyzed data from a worldwide network of RNGs, looking for synchronized deviations during emotionally significant world events and the results revealed patterns that appeared to correlate with periods of heightened shared attention and emotional intensity (Nelson et al., 2002). More recently, Holmberg extended this line of research by identifying correlations between deviations in GCP data and real-world indicators such as financial market movements and internet search trends, variables that are themselves responsive to emotionally charged global events (Holmberg, 2020, 2021, 2023, 2024). These findings suggest that some of the structured anomalies observed in the GCP data may align with shifts in such seemingly unrelated variables that are themselves sensitive to the same kinds of global events believed to affect the GCP data's behavior.

Taken together, this body of research points to the possibility that human cognition may introduce subtle and systematic biases into systems that should, in principle, behave randomly. These effects are reflected in structured patterns in RNG output that standard probabilistic models do not predict. However, despite the apparent empirical support (Utts, 1991), such findings have been met with considerable skepticism, as critics have suggested that the observed effects could be explained by statistical noise, inconsistent methods, or selective reporting (Alcock, 2003; Bösch et al., 2006; Scargle, 2002), small effect sizes that heighten the risk of Type I errors (Hyman, 1996), or uncontrolled experimenter and environmental variables (Wiseman & Schlitz, 1997). Some have also pointed to Decision Augmentation Theory (DAT), which suggests that the observed effects may stem not from direct influence, but from precognitive selection of favorable outcomes (May et al., 1995).

While these alternative explanations could account for some of the reported findings, they struggle to explain the persistence of entropy-related effects observed across numerous studies, researchers, and experimental contexts. In particular, they do not adequately account for the large-scale or time-synchronized deviations reported by the Global Consciousness Project (GCP). As a result, a fundamental question remains unresolved: are these statistical anomalies simply artifacts of methodological flaws, or do they point to a deeper, underlying phenomenon?

A major challenge facing the field is the lack of a robust theoretical framework capable of predicting and coherently explaining such effects. Without a model that integrates consciousness-related variables into established probabilistic reasoning, the debate risks becoming stalled in ambiguity and speculation. In response, some researchers have re-examined these anomalies, suggesting that they may reflect overlooked regularities rather than noise or chance (Drennan, 2015; Hardy, 2005; Walach et al., 2020). Although still preliminary, these reinterpretations highlight the need for models that maintain statistical rigor while remaining open to novel mechanisms grounded in consciousness research.

In response to these challenges, there is a clear need for a testable and falsifiable model that can evolve alongside empirical discoveries. To address this gap, the present study introduces the Cognitive Entropy Shift Model (CESM), a structured probabilistic framework designed to explore how cognitive engagement may lead to measurable deviations in systems typically governed by chance. CESM is grounded in the idea that consciousness can function as an informational constraint, capable of subtly modulating entropy and influencing probabilistic outcomes in ways that are statistically observable. In this context, "informational constraint" refers to the possibility that structured cognitive activity may bias the probabilities governing physical output distributions, without implying any non-physical or extraphysical mechanism.

The model builds on principles of probability updating that align with Bayesian inference, where outcome likelihoods are influenced by shifts in cognitive states. Similar Bayesian frameworks have previously been used to model mind–matter interactions (May et al., 1995) and CESM extends these approaches by formalizing how internal cognitive dynamics may introduce subtle biases into external stochastic processes. It thus offers a principled framework for reinterpreting anomalous findings and provides a theoretical and statistical basis for investigating consciousness-related influences using tools from probability theory and information science.

This paper makes several key contributions. First, it presents a mathematically grounded framework for modeling potential consciousness-related influences on probabilistic systems. Second, it evaluates this framework through a two-year continuous experiment conducted under stable conditions, designed to test claims that emotionally intense periods can influence output from truly stochastic systems. Third, the model is applied retrospectively to prior research, providing a coherent interpretive lens for earlier findings and generating clearer, testable predictions for future investigations.

The remainder of the paper is organized as follows. The next section outlines the theoretical underpinnings of the model, explaining how information theory and probabilistic reasoning can be used to frame the relationship between consciousness and stochastic processes. The following section develops the mathematical structure, incorporating variables related to cognition. This is followed by a section that presents empirical tests of the model based on the new two-year dataset. A subsequent section applies the framework to prior studies and the final section concludes with a discussion.

THEORETICAL FRAMEWORK

This section outlines the theory behind how consciousness might influence systems that normally behave randomly. A natural starting point for this analysis is the concept of entropy, which quantifies the degree of uncertainty or disorder in a system.

In the context of information theory, entropy reaches its maximum when all outcomes are equally probable and no prior information improves predictive accuracy. For a discrete random variable X, entropy is defined as:

$$(X) = -\sum_{i=1}^{n} P(x_i)\ log\ P(x_i), \tag{1}$$

Where $P(x_i)$ denotes the probability of each possible outcome x_i. Under ideal conditions, such as in systems governed by purely stochastic dynamics, entropy is maximized, and outcomes are uniformly distributed. This provides a principled baseline against which any systematic deviations can be detected and evaluated.

Previous empirical work has suggested that certain anomalous patterns may emerge in such systems under specific cognitive or emotional conditions. Although the reported effects are often small, some studies have observed statistically significant deviations from randomness during periods of heightened mental engagement or shared emotional focus (Jahn & Dunne, 1987; Nelson et al., 2002; Radin & Nelson, 2003). These findings have been interpreted as potential indicators of a link between consciousness and shifts in entropy. However, the absence of a widely accepted explanatory framework has left the interpretation of such results open to debate. While some researchers attribute the findings to unrecognized environmental factors or selection biases, others turn to alternative models such as Decision Augmentation Theory (DAT) (May et al., 1995). In short, DAT proposes that individuals may unconsciously time their actions to coincide with favorable outcomes, not through a direct causal influence on the RNG, but through a precognitive process in which the mind passively perceives future RNG states.

To move beyond post hoc interpretations, a formal modeling framework is required that is capable of capturing how cognitive variables might shape probabilistic systems in ways that are both theoretically coherent and empirically testable. Within this context, it is hypothesized that consciousness-related factors may act as informational constraints, effectively injecting structure into otherwise high-entropy systems. This leads naturally to a Bayesian formulation, in which shifts in cognitive states are treated as informational updates to a system's outcome probabilities. The proposed framework adopts this probabilistic perspective by introducing a model for updating prior distributions in response to the presence of cognitive" observations", deliberate or otherwise.

Let C denote a consciousness-related factor, and let the posterior probability of observing outcome x_i in the presence of C be given by Bayes' theorem:

$$P(x_i|C) = \frac{P(C|x_i) \cdot P(x_i)}{P(C)}. \tag{2}$$

Here, $P(x_i)$ represents the prior probability of the outcome under maximum entropy, and $P(x_i|C)$ expresses the

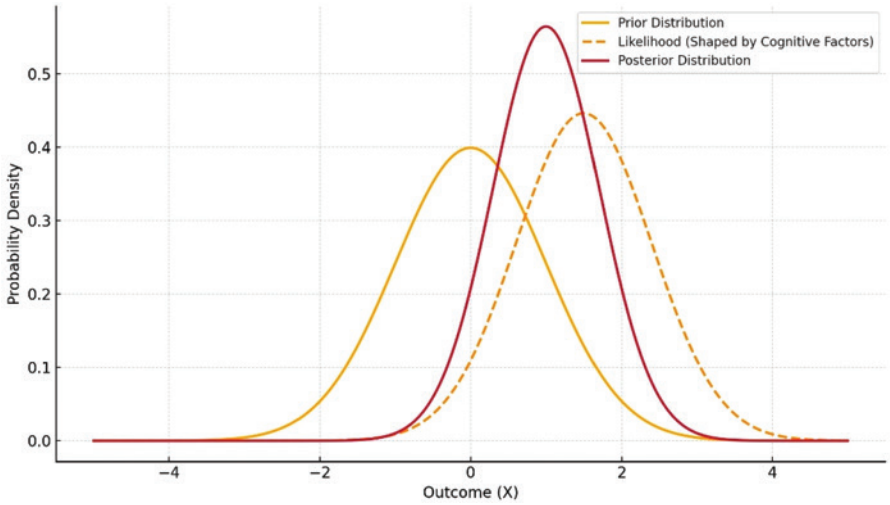

Figure 1. Illustrative Example of the Bayesian Updating Procedure.

likelihood of the cognitive influence (observation) given that outcome. Comparing the prior and posterior distributions allows for the detection of systematic deviations that may be attributable to consciousness-related influences. In this way, the model provides an information theoretical and statistical framework for testing whether internal cognitive states correlate with observable shifts in external probabilistic outcomes.

Figure 1 illustrates this process of Bayesian updating and shows how the prior distribution is updated to form the posterior distribution once the impact from cognitive influences (expressed as the likelihood) is incorporated.

Additionally, since entropy is calculated from probability distributions, it is possible to quantify the change in entropy that results from the influence of a consciousness-related factor *C* as follows:

$$\Delta H(X) = -\sum_{i=1}^{n} P(x_i|C)\ log\ P(x_i|C) + \sum_{i=1}^{n} P(x_i)\ log\ P(x_i). \quad (3)$$

Here, ΔH denotes the difference between the system's prior uncertainty (under maximum entropy) and its posterior uncertainty after accounting for observed cognitive effects. A non-zero value of ΔH could suggest that the probability distribution has been systematically altered, which could reflect that" information" has been structured by the influence of *C*. If statistical analysis confirms that $\Delta H \neq 0$ under controlled conditions, this would provide empirical support for the hypothesis that cognitive states can influence entropy within purely stochastic systems.

The preceding formalism outlines how consciousness-related factors might modulate probabilistic outcomes through entropy reduction and Bayesian updating. While the model remains grounded in measurable statistical quantities, it also resonates with a range of conceptual frameworks that attempt to describe consciousness in informational terms.

At its core, the model adopts Shannon's statistical definition of information, treating it as quantifiable and devoid of semantic content. However, several deeper interpretations of information have emerged in the philosophy of physics and consciousness studies. Among these, David Bohm introduced the notion of active information, which he described as a non-local, formative influence guiding physical systems from within. Bohm's concept of the implicate order serves as an ontological foundation from which the observable world unfolds (Bohm & Hiley, 1993).[1]

A parallel arises with interpretations of the observer effect in quantum mechanics, where measurement collapses a superposed system into a definite outcome (Jacobs, 2014). While conventional interpretations view this collapse as the result of a physical interaction, alternative perspectives propose that consciousness itself may participate in this process (von Neumann, 1932/1955; Wigner, 1961). Recent empirical work lends tentative support to this view and Radin (2025) reports statistically significant deviations in a quantum interference experiment when participants directed focused attention at the system, consistent with the von Neumann–Wigner hypothesis. Extending this logic, Williams (2024) suggests that empirical anomalies observed in consciousness-related studies might reflect unresolved informational dynamics within quantum theory, hinting at structures beyond conventional physical models.

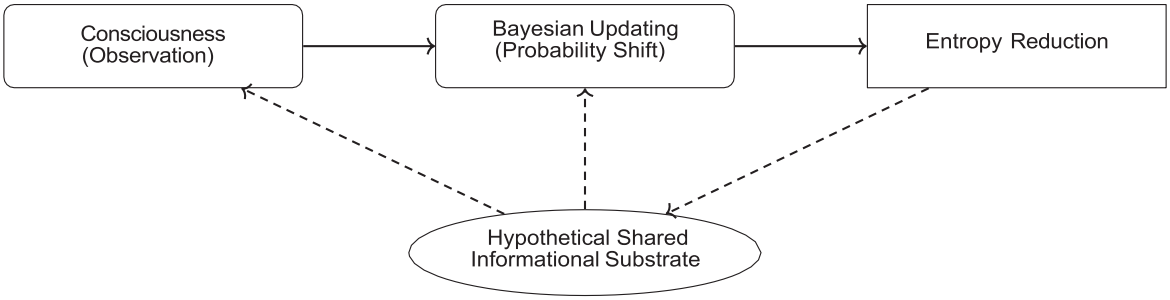

Figure 2. Conceptual Diagram of the Model and Concepts Discussed in this Section.

Further theoretical developments also challenge the sufficiency of classical determinism in accounting for the relationship between consciousness and apparent randomness. Faggin (2023), for example, argues that consciousness, creativity, and free will are incompatible with deterministic systems and instead emerge from non-algorithmic, quantum processes such as entanglement and non-locality.[2] Complementing this perspective, Bostick (2024) proposes that apparent randomness may result from partial or incomplete resonance detection. In his view, both entropy and cognition emerge from structured resonance within a coherent informational field. Consciousness, according to this model, arises as a phase-locked coherence pattern that can influence probabilistic outcomes by aligning with the underlying informational substrate.

These perspectives offer conceptual support for the presented model without requiring a commitment to any specific ontology. Rather than positing direct causation, the proposed framework adopts an information-theoretic and statistical lens to examine how and when entropy shifts may occur in conjunction with cognitive states. It remains agnostic about the ultimate origin of such effects yet allows for the possibility that they reflect interactions with a deeper informational structure not fully captured by existing physical theories. This conceptual logic is illustrated in Figure 2.

QUANTIFYING THE INFLUENCE

As outlined in the previous sections, several studies have reported statistically significant shifts in entropy ($\Delta H \neq 0$) that appear to be associated with variations in cognitive states (Jahn & Dunne, 1987; Jahn et al., 1997; Nelson, 2024). While these findings are intriguing, there is still no formal model that clearly shows how such influences might affect systems governed by chance. To move the work forward, the next section presents a flexible and general approach for measuring possible consciousness-related effects by looking at how entropy shifts over time in normalized data.

To better understand how consciousness might influence systems governed by chance, it helps to distinguish between two qualitatively different modes of cognitive engagement: active and passive influence. Active influence involves deliberate, goal-directed mental effort, consistent with established models of volitional control and intention-based behavior (Gollwitzer, 1999; Fishbein & Ajzen, 2010; Sheeran, 2002). Passive influence, by contrast, refers to spontaneous, emotionally driven engagement that occurs without conscious intent. It is best described as a state of emotional attentional presence i.e., a heightened, non-volitional form of awareness shaped more by emotional intensity than by deliberate thought (Posner & Petersen, 1990).

In the proposed framework, these two forms of cognitive influence are formalized as the variables intention (I) and attention (A), respectively. Whereas I reflects deliberate attempts to influence outcomes, A captures more diffuse and spontaneous attentional states that emerge in emotionally engaged contexts. This distinction is supported by a range of empirical findings. Experimental research conducted at the Princeton Engineering Anomalies Research (PEAR) laboratory demonstrated that focused mental intention could produce small but statistically significant deviations in the behavior of random systems (Jahn & Dunne, 1987, 2005). In contrast, studies from the Global Consciousness Project (GCP) revealed that subtle reductions in entropy often occur during large-scale emotionally charged events such as global tragedies or mass celebrations, without deliberate intention to influence the system (Nelson, 2002, 2020, 2021, 2024).

Additional evidence suggests that emotional reactivity may be a particularly important factor, especially in the context of widespread shared experiences. Studies of group consciousness effects have found measurable entropy shifts during collective emotional engagement (Nelson et al., 1996;

Nelson, 2024). Other exploratory analyses have expanded on these findings by showing correlations between deviations in GCP data and other real-world indicators sensitive to emotionally charged events such as financial market fluctuations (Holmberg, 2020, 2021, 2024) and internet search activity (Holmberg, 2023). Together, these lines of evidence reinforce the hypothesis that both intention and attention, though distinct in their cognitive profiles, may influence high-entropy systems through mechanisms that remain poorly understood, but which are nonetheless amenable to formal modeling and empirical investigation.

While the precise mechanism underlying such effects is not yet known, it is possible to outline a statistical framework capable of describing how consciousness might introduce structure into processes that would otherwise behave randomly. Such a framework enables the formulation of testable hypotheses in advance of data collection and provides a principled basis for analyzing how specific cognitive states may modulate entropy within stochastic systems.

At the core of this model are the two variables discussed above: intention (*I*), representing goal-directed mental effort, and attention (*A*), representing emotionally modulated, non-volitional engagement. Both are heuristically scaled from 0 (no influence) to 10 (maximum influence), allowing for a continuous representation of cognitive intensity. To capture possible synergy between the two, the model also incorporates a multiplicative interaction term (*I*·*A*), based on the premise that high levels of both intention and attention may jointly amplify the overall effect.

Another important consideration is spatial distance i.e., the physical separation between the participant and the system in question. The empirical literature on this topic is mixed. Some studies suggest that intention-related effects are largely independent of distance (e.g., Jahn et al., 1991), while others find evidence that can be interpreted as support in favor of that distance could be important, particularly in emotionally charged contexts where attention dominates (see e.g., Jahn et al., 1997; Leskowitz, 2011).

To accommodate both perspectives, the proposed model integrates distance-dependent and distance-independent components into a single unified expression. The general form that captures this logic is given by:

$$E_{RNG,m} = \frac{\left[\sum_{i=1}^{n}\sum_{C\in\{I,A,I\cdot A\}}\left(\beta_C \cdot \frac{C_{i,m}}{e^{\alpha\cdot d_{i,m}}}\right)\right]\cdot\frac{\Phi^{-1}(q)}{\left(1+\frac{1}{n}\right)}}{1+n} + \varepsilon_m. \quad (4)$$

In this equation:

- $E_{RNG,m}$ denotes the predicted shift in output from RNG_m, due to consciousness-related effects.
- $C_{i,m}$ stands for the value of each consciousness related variable (intention, attention, and their interaction) experienced by participant *i*. Each variable is weighted by a corresponding coefficient β_C.
- $d_{i,m}$ denotes the spatial distance between participant *i* and RNG_m, and the exponential term $(e^{\alpha\cdot d_{i,m}})$ describes how influence decays with distance, moderated by the parameter α.
- Φ denotes the cumulative distribution function (CDF) of the standard normal distribution, mapping the standardized entropy deviation into a probabilistic significance estimate.

To improve sensitivity to rare but meaningful deviations, the model incorporates a high quantile threshold q = 0.999999999, which corresponds to approximately six standard deviations under a standard normal distribution ($\Phi^{-1}(q) \approx 6$). This scaling defines an upper-bound window for identifying statistically anomalous cases under the null model, thus making rare events more visible. A normalization term involving the number of participants (n) prevents the effect from growing uncontrollably as the sample size increases and a final residual term, $\varepsilon_m \sim N(0,1)$, captures baseline random variation in RNG output. The RNG output thus simplifies to a standard normal distribution in the absence of consciousness-related influences, as expected under maximum entropy conditions.

The expected value of the output $E_{RNG,m}$ can thus be interpreted as a standardized deviation from randomness, expressed in units equivalent to a Z-score. Higher absolute values of $E_{RNG,m}$ indicate increasingly improbable outcomes under the null model, thereby allowing direct comparison between model predictions and empirical results from RNG-based studies.

A central assumption of Equation (4) is that each participant contributes a small, additive influence on the RNG output. As a result, the total effect scales linearly with the number of participants (n), while the denominator serves to normalize the output to ensure it remains bounded even as n increases. This additive component is best interpreted as the system's raw bias i.e., the total deviation from expected entropy introduced by the cognitive variables.

By incorporating both additive influence and statistical normalization, the framework formalized by Equation (4) provides a robust and extensible basis for quantifying

how cognitive and emotional factors may affect the output from RNGs. The model however also remains open to further refinement and allows for future exploration and integration of additional consciousness-related parameters (e.g., emotional coherence, expectation, group synchrony, and so forth).

Importantly, the model is not tied to any specific statistical test for detecting entropy shifts. Instead, it expresses deviations in standardized units relative to an expected mean, making it possible to reinterpret earlier results through the lens of the proposed framework. Whether previous findings were based on Gaussian Z-tests, t-tests, or other well-established methods is not critical. What matters is that the results were obtained using sound statistical procedures and reported in a way that allows deviations from a hypothesized mean to be meaningfully assessed. This flexibility makes the model especially useful for the retrospective analysis of historical data.

In practical applications where individual-level data are unavailable, a simplified version of the model can be used. If all participants are assumed to contribute equally i.e., with the same levels of attention and intention, and at the same distance from the device producing the stochastic data, then the summation collapses into a single scalar multiple of *n*, the number of individuals. In addition, if one is only interested in the magnitude of the effect rather than its direction, the expression can be further simplified by taking the absolute value. The simplified equation for a representative RNG is given by:

$$|E_{RNG}| \approx \frac{\left(\beta_A \cdot \frac{A}{e^{\alpha \cdot d}} + \beta_I \cdot I + \beta_{I \cdot A} \cdot \frac{I \cdot A}{e^{\alpha d}}\right) \cdot n \cdot \frac{\Phi^{-1}(q)}{\left(1 + \frac{1}{n}\right)}}{1+n} + |\varepsilon|. \quad (5)$$

The simplified version of the model is especially useful in cases where detailed participant-level data on attention or intention are not available, as is often the case in many historical studies. As such, the framework can be applied retroactively to previously published results, offering a consistent way to reinterpret past findings through a shared lens.

This approach, which treats consciousness-related variables as informational influences that may locally reduce entropy, will be referred to as the Cognitive Entropy Shift Model (CESM). CESM provides a structured and testable framework for exploring how attention and intention could interact with stochastic physical systems. It also serves as the theoretical foundation for the empirical analyses that follow.

Figure 3 provides a schematic overview of the model's logic. Input variables, namely intention, attention, their interaction, and spatial distance, are all fed into scaling and decay functions and combined using parameter weights (β_C) and the spatial decay (e^{ad}). These modified inputs are then aggregated across *n* participants, passed through a high quantile filter Φ-1(q), and normalized to yield the final standardized output $E_{RNG,m}$, representing the predicted deviation from baseline entropy.

However, to meaningfully apply either the full model (Equation (4)) or its simplified form (Equation (5)), plausible values must be assigned to its key parameters. These include the strength of the consciousness-related effect on calculated output (β_C) and a distance decay parameter (α) that governs how quickly the influence weakens with spatial separation. The true values of these parameters are not yet known and will need to be determined through future empirical work designed with that goal in mind. For now, however, initial working estimates, based on the structure of the model and guided by insights from earlier experimental findings are presented in Appendix A.

TESTING THE MODEL IN A NEW EXPERIMENT

With the theoretical framework in place, the next step is to apply the model to empirical data. The following section

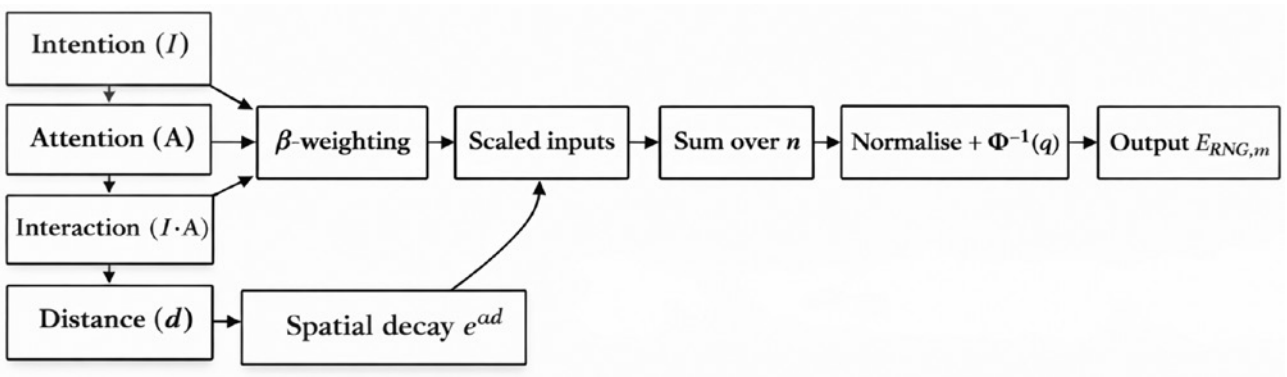

Figure 3. Visual Representation of the Consciousness–RNG Influence Model.

describes a two-year experiment conducted in a stable domestic environment, using a physical random number generator (RNG) that continuously recorded data. The setting was a private apartment in Stockholm, and the individuals whose psychological states were hypothesized to influence the RNG output included two young children and one adult, all residing in the household.

The analysis focuses on periods that were anticipated to involve heightened emotional states and attentional engagement, based on prior knowledge of daily routines. The central hypothesis is that emotionally intense cognitive states among the participants may produce subtle, structured deviations in the statistical properties of the RNG output, in line with the predictions of the Cognitive Entropy Shift Model (CESM).

This section thus serves two main purposes: (i) to provide an independent test of earlier claims that consciousness may influence physical RNGs, and (ii) to assess the model's capacity to estimate levels of attentional involvement based on observed deviations in entropy. Additional methodological details are provided in Appendix D.

Experiment Setup and Test Statistic

The two-year experiment ran from March 2022 to March 2024 using a TrueRNG v3 device, which generates random numbers via the avalanche effect at a semiconductor junction. The device was placed approximately 10 meters from an area that was a priori identified as likely to involve predictable periods of elevated emotional intensity and attentional presence, conditions which according to CESM, may reduce entropy in the device output.[3] The TrueRNG v3 device was connected to a Raspberry Pi 400, which recorded one random value per second throughout the study. To maintain high-quality output, the device's internal firmware applied XOR mixing to the raw signal before each value was logged.[4]

This built-in whitening process combines approximately 20 raw bits to generate each final output bit, reducing short-term correlations while preserving the overall entropy of the signal.[5] To further safeguard data quality, the device's temperature and power supply were periodically monitored throughout the study to reduce the likelihood of hardware-related anomalies or placement-induced effects.[6]

By the end of the experiment on March 19, 2024, the device had generated a total of 47,731,465 values. Of these, 8,789,615 were excluded, as the three participants were known to be far away from the local area during those times. This left 38,941,850 valid observations that was timestamped to allow alignment with known routines and periods of emotional engagement.

Before the experiment began, the morning window between 07:30 and 08:15 was identified in advance as a predictably "stressful" period. This time frame was chosen based on the hypothesis that heightened emotional intensity and focus (common during school preparations) could amplify attention and potentially lead to measurable deviations in the RNG output.[7]

To better capture the dynamics predicted by CESM, the 45-minute morning window (07:30–08:15) was first divided into three non-overlapping 15-minute segments: 07:30–07:45, 07:45–08:00, and 08:00–08:15. This allowed for a more detailed look at how fluctuations in emotional intensity and attentional presence may have influenced entropy during different parts of the morning routine.

However, given the assumption that emotional engagement would peak as participants exited the premises, a targeted window from 07:50 to 08:10 was also selected for closer examination. This interval, representing the most behaviorally intense portion of the morning routine, was contrasted with a control period from 08:10 to 08:25, during which usually no participant remained near the device such that no localized stress was expected. As can be understood from the above, the working hypothesis was that 07:50–08:10 would exhibit the strongest deviation from baseline entropy, followed by 08:00–08:15, as both intervals encompassed the critical departure period marked by elevated emotional intensity and attentional engagement. In contrast, the 08:10–08:25 window served as both a behavioral and spatial control. However, because these segments partially overlapped with the previously defined time windows, the resulting statistical comparisons were not entirely independent. To account for the increased risk of false positives due to multiple testing, a conservative Bonferroni correction was applied.

To put the morning results in context, the full 45-minute period from 07:30 to 08:15 was also compared to several other 45-minute intervals spread throughout the day. These served as matched control periods, helping to assess whether any observed effects were unique to the morning routine or simply part of broader fluctuations in entropy.

After defining these intervals, the output from the device was normalized using the different subsets empirical mean and variance, using rolling data over one month. Given that the raw data automatically had undergone XOR processing,

a method capable of masking subtle deviations, it was essential to employ a statistical approach sensitive to more underlying structural changes.[8] As such, the Welch's t test was selected due to its robustness against unequal variances and its ability to detect shifts in both mean and variance.

Formally, Welch's t-statistic is given by:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}, \quad (6)$$

where $\bar{X}_1$ and $\bar{X}_2$ are the sample means of the full dataset and the selected subset, σ_1^2 and σ_2^2 their variances and n_1 and n_2 the respective sample sizes.

RESULTS

Table 1 presents descriptive statistics, and the results of the Welch t-test based on the normalized RNG data. As predicted by the CESM, the RNG output exhibited deviations during intervals of heightened attention. The mean values for each tested interval exceeded those of the full dataset, resulting in negative differences between the subsets and the overall sample. Statistically significant deviations from randomness were observed in the intervals 07:55–08:10 ($p \approx 1.38 \times 10^{-5} < 0.001$) and 08:00–08:15 ($p \approx 3.91 \times 10^{-4} < 0.001$) Therefore, the broader 45-minute window (07:30–08:15), which encompasses these segments, also yielded a highly significant deviation ($p \approx 9.86 \times 10^{-5} < 0.001$) In contrast, the control period (08:10–08:25) showed no significant deviation from chance ($p \approx 0.585$) suggesting that the observed morning anomalies are unlikely to be due to random variation alone.

The small yet statistically significant mean shifts observed during peak intervals (e.g., a deviation of −0.00676 during 07:55–08:10) are notable as the RNG's internal firmware performed XOR whitening by combining approximately 20 raw bits into each final output bit to reduce short-term correlations. That the observed effects persist after whitening suggests that the underlying raw signal was consistently biased, with the post-whitening deviations implying a sustained bit stream skew of approximately 3–6% above chance, pointing towards a subtle but systematic departure from ideal randomness.[9]

It is conceivable that environmental factors such as temperature shifts, device instability, or time-of-day-related variables like increased movement or nearby electronic activity, could in principle have affected the RNG output. However, such effects would be expected to manifest more strongly during periods like 07:30–07:45, when movement and interaction levels were typically highest. The fact that the most pronounced deviations occurred instead during 07:55–08:10 and 08:00–08:15, while neighboring intervals like 07:30–07:45 and 08:10–08:25 remained unaffected, makes it less likely that the effects were due to mundane environmental noise. That said, future studies should incorporate more detailed environmental logging to better account for potential unnoticed influences. Still, the distinct temporal specificity and strong statistical significance of the results suggest that ordinary explanations are unlikely to fully account for the observed deviations.

In summation, the results from the experiment strongly suggest that $\Delta H \neq 0$ in Equation (3) during periods marked by heightened emotional intensity and increased attentional engagement. The observed shift in mean RNG output was modest as it ranged from approximately 0.5% to 0.7%, yet highly statistically significant ($p < 0.001$) Although these effects fall below the thresholds needed for real-time detection, they align closely with findings from earlier RNG studies and underscore the importance of large sample sizes when probing for such subtle deviations.

Despite these challenges, the present dataset provides strong grounds for confidence in the robustness of the observed effects. A 0.5% change in the normalized mean corresponds to only 0.005 standard-deviation units, yet power analysis shows that a two-sided Welch t-test at the 1% significance level with 95% power would require "only" about 7.1×10^5 observations to detect such a shift, which is well below the 3.9×10^7 data points analyzed in this study. Even subtler changes of 0.15% could be reliably detected with approximately 8.0×10^6 observations, a quantity easily achievable within a few months of continuous recording.[10] These figures not only affirm the statistical power of the current results but also provide clear and practical benchmarks for future preregistered studies designed to replicate and extend CESM-based predictions under controlled conditions.

Given CESM's structure and its formal link between entropy shifts and attentional states, a natural next step is to ask how much attentional engagement would be needed to account for the observed deviations. Since the participants were largely unaware of the RNG's presence, no direct cognitive measurements were collected during the studied periods.[11] However, CESM allows for a retrospective estimation. Specifically, the simplified version of the model, Equation (5), was designed to accommodate precisely this kind of constraint and is therefore applied

Table 1. Experiment Data: n = 38,941,850 ≈ 15.2 Months.

Subsample	*n*	$\Delta\bar{X}$	Δσ	t-stat	*p*	*Bonf-p*	*A*
07:30–08:15†	1,136,553	−0.00367	−0.00013	**−3.894**	< **0.001**	< **0.001**	7.70
07:30–07:45	411,242	−0.00174	−0.00247	−1.118	0.264	1.000	–
07:45–08:00	389,082	−0.00337	0.00017	**−2.110**	**0.035**	0.209 (4.16*)	
08:00–08:15	434,059	−0.00531	0.01884	**−3.546**	< **0.001**	< **0.001**	7.01
07:55–08:10	410,357	−0.00676	0.00031	**−4.347**	< **0.001**	< **0.001**	8.60
08:10–08:25	394,016	−0.00085	−0.00118	−0.536	0.592	1.000	–

Note. $\Delta\bar{X} = X_1 - X_2$; $\Delta\sigma = \sigma_1 - \sigma_2$ where "1" represent the full sample compared with the subsample "2". Bold values indicate significance at the 5% level using a two-sided Welch's t-test. Bonf. p = Bonferroni-corrected p-value. (*) Result not significant after Bonferroni correction.[17]

†The 07:30–08:15⁺ sample is slightly more restricted than the sum of the three adjacent 15-minute intervals, excluding 97 830 data points to reduce overlap and maintain clearer statistical separation between comparisons. By using a distinct sample for the full 45-minute period, the analysis preserves statistical robustness and ensures that p-values remain interpretable under Bonferroni correction without inflating the Type I error rate due to hidden overlap (cf. Wilcox (2010).

here to estimate the level of emotional engagement needed to elevate attention (*A*) to a degree consistent with the empirical results.

This analysis is limited to time windows that surpassed the 5% significance threshold, and the corresponding attention values are reported in the final column of Table 1. Given that *A* is bounded between 0 and 10, it can be understood from the results that attentional presence was substantially elevated during certain periods, reaching a value of 8.60 during the 07:55–08:10 interval.[12]

The control period from 08:10 to 08:25 was chosen because participants had typically left the premises by then. As anticipated, this interval showed no statistically significant deviation, lending further support to the idea that emotional intensity and heightened attention can influence the RNG output. Another aspect that changed after 08:10 was physical proximity and to examine this relationship more closely, the observed results were re-evaluated using Equation (5), but this time after assuming increased spatial separation. Holding the previously estimated attention level constant, the analysis revealed that the observed effect disappears entirely when the distance is scaled up from approximately 10 meters (about 33 feet) to 1 000 meters (roughly 0.6 miles), representing a hundredfold increase, suggesting that proximity may be a critical factor in modulating the effect. This pattern strongly calls for more research to be made on calibrating the spatial decay parameter (α) more thoroughly.

To investigate whether similar deviations appear elsewhere in the dataset, the full two-year time series was divided into 32 non-overlapping 45-minute intervals distributed across the 24-hour cycle. The Welch's t-test was then applied to each window to detect any departures from randomness and as shown in Figure 4, only the 07:30–08:15 interval displayed a robust and statistically significant effect as it was the only 45-minute period that breached the conservative Bonferroni adjusted significance threshold.

Addressing Common Statistical Criticisms

Given the ongoing skepticism surrounding studies on consciousness-related influences in random systems, it is important to address key methodological concerns directly and transparently. These concerns are not new; they have been repeatedly emphasized in critical appraisals of psi-related research, particularly with regard to analytic flexibility, optional stopping, and the absence of preregistration (e.g., Wagenmakers et al., 2011). The present study was designed with these issues in mind. The most frequently raised methodological points, including optional stopping, selective reporting, and multiple comparisons, are each considered in turn below.

Optional stopping was not a factor in this study as the data collection period (March 2022 to March 2024) was determined in advance and as no decisions to terminate or extend the experiment were made based on interim results. Although notable effects began to appear within the first year, the data collection proceeded exactly as planned.[13] Concerns about selective reporting were also addressed by including all predefined time windows in the analysis, regardless of whether they yielded significant results. The outcomes are thus presented transparently in Table 1 and visualized in Figure 4, ensuring that no intervals were omitted or selectively emphasized. Finally, the risk of inflated false positives due to multiple comparisons

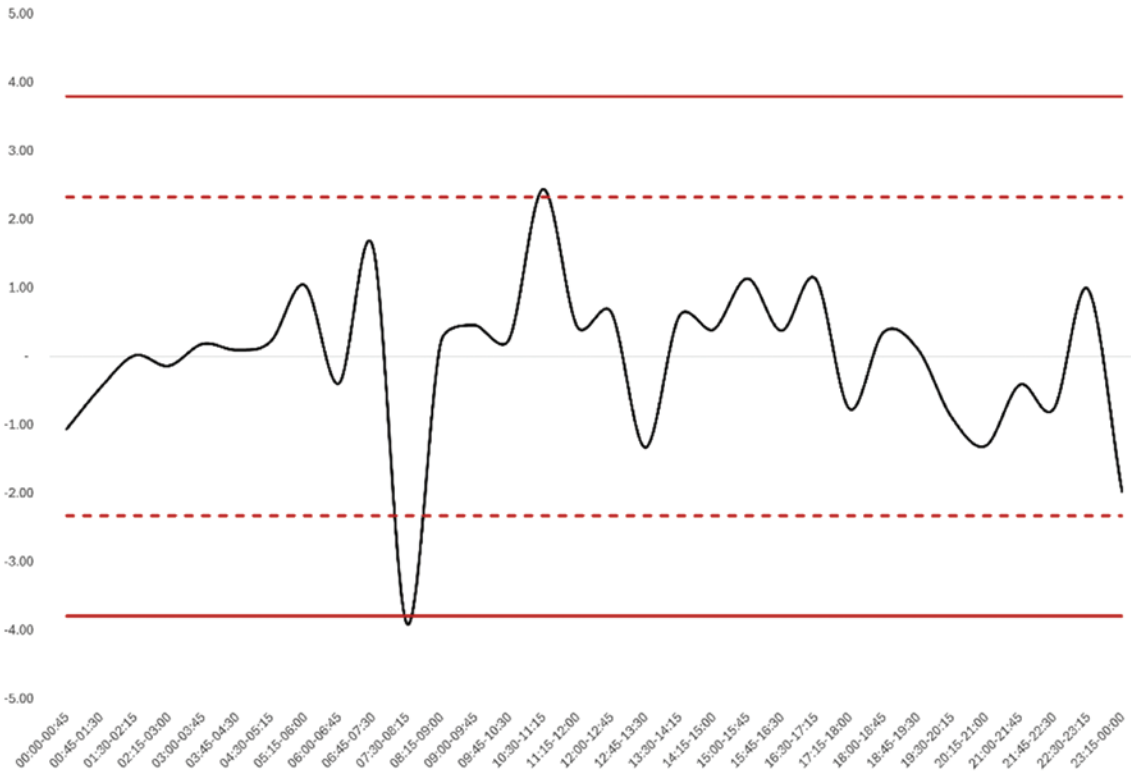

Figure 4. The Welch t-statistic over a 24-hour Period.
Note: The dashed red line is the 1% significance threshold while the solid red line marks the conservative Bonferroni 1% significance threshold, corrected for 32 comparisons under a 1% family-wise error rate.

has been handled using the conservative Bonferroni correction. This adjustment was applied to control for the overlapping time segments, where the chance of spurious significance would otherwise increase.

Taken together, these safeguards were built into the study design from the outset to meet standard statistical expectations. They help ensure that the findings are interpreted on a fair and robust foundation, particularly in a field where critical scrutiny is both expected and warranted. Although direct numerical comparisons are difficult due to differing effect-size metrics, the subtle yet statistically significant deviations observed here (approximately 0.5–0.7%) resonate with the general pattern of small but consistent anomalous effects reported in related meta-analyses such as Bem et al. (2015).

APPLYING THE MODEL TO HISTORICAL RESULTS

Having demonstrated the practical usefulness of the model in Equation (5) through a long-term real-world experiment, the next step is to test its broader relevance by applying it to previously published studies. This serves as a critical validation: if the model can reliably interpret or reinterpret past results, it may offer a general framework for analyzing both historical and future RNG-related findings. This section therefore examines how earlier empirical results align with the structure of the proposed framework. Since the simplified version of the model was designed specifically for retrospective use, it allows for estimation of average levels of cognitive engagement. More precisely, the degree of goal-directed intentional mental effort (I) and emotionally modulated attentional presence (A) are calculated using the studies reported normalized deviations in RNG output.

When applying the model to earlier studies, it is assumed that experiments involving participants who deliberately attempted to influence RNGs include both goal-directed intention ($I > 0$) also engage in some heightened degree of attention (A) For simplicity and tractability, the model assumes $I = A$ in such cases, meaning that participants are directing their attention toward a task in a deliberate and purposeful way. This assumption reflects the idea that intentional mental effort typically requires a corresponding level of focused attention, a claim that should be studied and challenged in future research. In contrast, studies where participants were unaware of the device or made no conscious effort to affect it, intention is set to zero ($I = 0$) such that only attention needs to be estimated.[14]

Dunne et al. (1988)

This study investigated if participants could influence the distribution of balls in a physical cascade machine, specifically a Galton board (Dunne et al., 1988). Each participant directed their intention toward shifting the results to the left or right, and the results showed statistically significant deviations from the random expectations.

In the experiment, one person sat about 2–3 meters away from the device and tried to mentally influence how the balls would land. The machine automatically dropped a set number of balls each time, which bounced through a series of pins before landing in the bins at the bottom. Some trials involved focusing intention to the left or right, while others were control trials with no intention, used to compare against a baseline.

In total, 87 series were run by 25 different participants, with just one person trying to influence the outcome at a time. When all the results were combined, the overall z-score came out to 3.89, revealing a strong effect with a significance level of $p < 10^{-4}$. Using the model from Equation (5), and assuming that intention and attention were equally strong during the trials, the estimated values were $I = A = 6.70$.

Nelson (2024)

The Nelson (2024) presents a FieldREG study conducted in Egypt to explore whether group consciousness might influence the output of a RNG during visits to culturally and historically significant sites.

The experiment focused on sacred locations such as the inner chambers of pyramids and ancient temple sanctuaries, where participants engaged in activities aimed at enhancing group coherence. The study involved approximately 19 participants and used a portable RNG, positioned within proximity of the group. The device recorded continuously throughout the sessions, with precise timestamps enabling alignment between specific activities and fluctuations in RNG output.[15]

For the analysis, the data were sorted into five well-defined categories and for this retrospective analysis, the *Z*-scores in Table 3 of the Nelson (2024) study are used as they show how strongly the REG output during each event category deviated from what you'd expect by pure chance (after adjusting for randomness using resampling). In terms of CESM, these adjusted *Z*-scores tell us how much entropy seems to have been reduced during each type of group activity, helping us estimate the average attention level (A) required to produce such effects.

- *Category A – Sacred Sites with Group Ritual Activity*: This category included 26 visits to temples and pyramid chambers, where participants engaged in coordinated rituals such as chanting and meditation. These were the most focused and emotionally intense activities, and the data showed a clear deviation from chance ($Z = 3.45$). Using CESM, attention is estimated to have been $A = 6.85$.
- *Category B – Sacred Sites Without Formal Group Activity:* This included 20 site visits where no coordinated rituals were performed, even though the group was present in resonant locations. Despite the absence of structured group activities, the data revealed a significant deviation ($Z = 3.02$). Using CESM, emotionally modulated attention is estimated to have been $A = 6.01$.
- *Category C – Group Activity at Non-Sacred Sites*: These 15 visits involved group engagement in settings not considered spiritually significant (e.g., hotels or restaurants). The results were consistent with chance ($Z = 0.45$).
- *Category D – Visits to Other Notable but Non-Sacred Locations:* This category captured 18 instances of visits to engaging but secular locations like museums or historical landmarks. A modest deviation from randomness was observed ($Z = 2.16$), yielding an estimated attention level of $A = 4.31$.
- *Category E – Personal or Solo Experimenter Events:* This final category involved 10 solo experiences by the experimenter. The result ($Z = 0.99$) was statistically insignificant.

Leskowitz (2011)

In this study, it was investigated whether collective attention from a large audience could influence the output of a random number generator (RNG). The study was conducted during a Major League Baseball game between the Boston Red Sox and the Toronto Blue Jays on July 13, 2007 (Leskowitz, 2011).

Approximately 36,000 spectators attended the game, with their collective attention and emotional engagement varying significantly throughout the match. A single RNG continuously produced data from a fixed location within the stadium.

Although Leskowitz did not report precise distances, reasonable assumptions can be made based on typical stadium

layouts. Actively engaged spectators were likely positioned at distances ranging from 30 to 120 meters, with a weighted average estimated at approximately 70–80 meters.

RNG outputs were recorded and analyzed in one-minute intervals, allowing for detailed temporal assessment of deviations from expected randomness. Out of 117 analyzed intervals, 15 showed deviations equal to or greater than ±2 standard deviations from the mean. This yielded an overall z-score of 4.19, representing a highly significant deviation from chance expectation.

Fluctuations in the RNG output were also found to coincide with moments that were assessed as involving heightened audience attention. Applying the simplified model from Equation (5), and assuming no deliberate intention ($I = 0$), the level of attentional engagement during these high-intensity intervals is estimated to be $A = 8.76$.

CONCLUDING REMARKS

This paper introduced the Cognitive Entropy Shift Model (CESM), a formal and testable framework for exploring whether consciousness, specifically cognitive states such as deliberate intention or emotionally modulated attention, can subtly influence the behavior of systems governed by chance.

Grounded in Bayesian inference and information theory, and building on earlier Bayesian approaches to mind–matter modeling, CESM differs by treating consciousness not merely as a modulator of outcome probabilities, but as an informational constraint capable of reshaping entropy within stochastic systems. To test this proposal, data from a high-entropy random number generator (RNG) was collected over two years, and CESM was applied to predict when measurable deviations from randomness would occur. The analysis revealed statistically significant deviations ($t = -4.347$, $p < 0.001$) during periods characterized by heightened emotional attention, consistent with the model's predictions of entropy reduction under cognitive engagement. While the results are not conclusive, they reveal robust and highly significant correlations that not only align with prior findings in the field but also suggest that entropy-based cognitive constraints may play a meaningful role in shaping probabilistic physical systems.

Although RNGs served as the controlled source of probabilistic data in this study, CESM is not conceptually limited to them. Its purpose is not to explain the mechanism underlying deviations from randomness, but to detect and model structural departures from statistical expectation, regardless of the data source. The framework applies broadly to stochastic systems found in natural, biological, digital, or engineered settings. This generality enables both prospective testing in new environments and retrospective analysis of anomalous datasets within a unified statistical framework.

The strength of the current findings lies not only in the statistical robustness of the signal, detected across tens of millions of data points, but also in CESM's capacity to differentiate between distinct cognitive influences. The results indicate that attention, particularly when emotionally engaged and spatially focused, produces measurable entropy shifts that diminish with increasing distance. This may involve not only physical separation but also psychological detachment from the target system, a possibility that future research could explore. In contrast, broader, potentially nonlocal effects associated with goal-directed intention are not directly demonstrated here but are consistent with patterns reported in earlier research. This observed asymmetry aligns with emerging perspectives of consciousness as both embodied and extended, with the potential to interact meaningfully with nonlocal environments (von Lucadou et al., 2007).

Philosophically, CESM builds on and synthesizes insights from multiple fields. It aligns conceptually with Quantum Bayesianism (QBism) (Fuchs, 2014), which treats probabilities as belief updates conditioned on observation, and with Stapp's view that mental states might modulate quantum events via informational channels (Stapp, 2017). The model also resonates with Bohm's concept of active information (Bohm & Hiley, 1993) and Laszlo's hypothesis of a universal coherence field (Laszlo, 2004), where meaning and form guide physical systems.

From a thermodynamic perspective, CESM draws a conceptual analogy to Maxwell's Demon (Maxwell, 1871), a thought experiment in which an intelligent agent appears to violate the second law of thermodynamics by selectively allowing faster or slower particles to pass through a gate. This selective sorting seems to reduce entropy without performing any physical work. The paradox was later resolved by recognizing that Maxwell's demon must acquire, store, and eventually erase information in order to carry out its task. These processes require energy and therefore uphold the second law. This resolution led to Landauer's principle (Landauer, 1961), which formalizes the connection between information and thermodynamics by showing that erasing even a single bit of information necessarily increases the entropy of the environment. In this light, CESM does not suggest that cognitive states

violate physical laws. Rather, it proposes that they may act as informational constraints that influence probabilistic systems. Much like the demon, consciousness could reshape entropy distributions through information-based processes instead of direct energetic intervention.

Looking ahead, CESM provides a flexible platform for systematic research across a wide range of domains. To strengthen its reliability and replicability, future studies should emphasize preregistration, the use of validated psychological measures, and standardized data collection protocols. Beyond refining CESM's core parameters, such as the rate of spatial or psychological decay and the strength of influence exerted by different cognitive states, researchers can also explore its application to other complex and probabilistic systems, including biological and economic systems. Investigating nonlinear interactions, contextual factors, and the role of group or collective mental states could help shape a more general and robust second-generation version of the model. A related extension, developed in Appendix B, examines how the framework may be adapted to analyze effects on large-scale coherence measures, such as those explored by the Global Consciousness Project, thereby allowing CESM to be formulated at the level of collective rather than strictly individual cognitive dynamics. Moreover, future work may examine whether other forms of conscious entities, human or non-human, can similarly nudge randomness in measurable ways.

In closing, CESM re-frames the question of consciousness and physical systems not in terms of energetic causation, but as a matter of informational influence. It suggests that consciousness may exert a subtle but systematic organizing role in probabilistic environments, and that it can subtly nudge randomness. This perspective invites a reconsideration of the mind's role in nature as it suggests that it is a lawful contributor to how reality unfolds. While the mechanisms remain to be fully uncovered, CESM offers a philosophically neutral, empirically grounded framework for advancing both theoretical insight and scientific inquiry into the interplay between consciousness, information, and randomness.

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DATA AVAILABILITY

The dataset is available from the author upon request.

END NOTES

1 While the proposed framework remains ontologically neutral and focused on measurable entropy shifts, it is conceptually compatible with the idea that reductions in entropy may reflect interactions with a deeper, potentially conscious informational substrate.

2 This view is developed within Faggin's framework of Quantum Information-based Panpsychism (QIP).

3 The device was positioned under a TV bench located between two children's rooms, about 10 meters from the main entrance. To minimize electromagnetic noise, the TV remained unused during morning hours throughout the study.

4 Further details about the experimental setup, participants, spatial layout, data filtering, and environmental controls can be found in Appendix D.

5 A detailed discussion on XOR mixing and what it does with the data can be found in Appendix C.

6 Data was retrieved at 256 bytes per second using a batch script provided by Dr. Thiago Jung.

7 It was hypothesized that stress and emotional engagement might increase attentional presence, which CESM predicts could subtly reduce entropy in the system.

8 Although XOR mixing redistributes short-term bit-level patterns, it does not fundamentally remove persistent statistical anomalies. A more detailed explanation, including its relevance for detecting cognition-linked effects in entropy, is provided in Appendix C.

9 This estimate is based on binomial modelling of the XOR whitening process, where each output bit reflects the parity of ~20 biased input bits.

10 Required sample sizes were estimated using the standard normal approximation for power analysis.

11 Only one participant was aware of the device, but even this participant disregarded its presence due to the nature of the study period and the extended duration over which the data were collected.

12 Intention (I) is assumed to be zero, in line with the nature of the situational "friction" that likely elevated attention without deliberate goal direction. Additionally, n is interpreted as the product of the number of participants and the number of observations within each subsample.

13 The one-year preliminary results were presented on a recorded GCP2-team meeting in March 2023.

14 These modeling assumptions are introduced to allow parameter estimation from incomplete historical data and should be tested and refined in future controlled experiments.

15 While the study does not state the exact distance between participants and the device, the described setup implies proximity. For modelling purposes, this is approximated to $d = 10$ while assuming that $I = 0$.

16 Thes values are illustrative and not derived from data. There precise magnitude remains an empirical question to be resolved through future experimentation.

17 The table summarizes statistically significant mean shifts in the normalized RNG output, where the expected value under the null hypothesis is zero. The observed deviations, ranging from approximately 0.34% to 0.68%, reflect persistent shifts in the post-whitening output from the expected mean. When accounting for the 20-bit XOR whitening process used by the device, and assuming a moderate to high autocorrelation in the raw bitstream (e.g., $\rho \approx 0.80$), these shifts correspond to an underlying raw bitstream bias of approximately 3%–6% above chance. This suggests a subtle but measurable departure from ideal randomness that persists even after standard entropy-flattening procedures.

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APPENDIX A

PARAMETER SELECTION AND LIMIT BEHAVIOR

This appendix outlines the rationale and assumptions behind the parameter values used in the Cognitive Entropy Shift Model (CESM). The aim is to ensure internal consistency and provide plausible starting points for empirical testing. Two key aspects are addressed: the model's asymptotic behavior under idealized conditions, and the influence of spatial distance, based on prior experimental findings.

Limit Behavior and Scaling of Cognitive Parameters

To provide initial parameter estimates and ensure the model's robustness, it is instructive to examine its limit behavior under idealized conditions. Specifically, the parameters β_C can be constrained by analyzing a scenario in which participants exhibit maximum levels of attention (A = 10) and intention (I = 10), with no spatial distance (d = 0), and where the number of participants and observations approaches infinity ($n\to\infty$). By doing so, it is possible to establish theoretical upper bounds that can later assist in empirical calibration within more realistic experimental contexts.

To ensure well-defined asymptotic behavior, the model parameters must be selected such that the function converges precisely to $\Phi^{-1}(q)$, where q = 0.999999999, as $n\to\infty$. Under the assumption that distance is zero (i.e., d = 0), the exponential decay term simplifies to $e^{\alpha\cdot d} = e^0 = 1$. Consequently, the consciousness-related terms in Equation (4) reduce to:

$$\beta_I \cdot I + \beta_A \cdot A + \beta_{I\cdot A} \cdot (A \cdot I).$$

Assuming maximum cognitive engagement, the sum of the weighted terms must satisfy: $\beta_I \cdot 10 + \beta_A \cdot 10 + \beta_{I\cdot A} \cdot 100 = 1$. This constraint ensures that consciousness-related influences scale appropriately, allowing the model to converge to the theoretical upper bound $\Phi^{-1}(q)$ as $n\to\infty$.

Drawing on empirical considerations, it is observed that intention typically occurs in conjunction with attention, whereas attention can manifest independently in emotionally engaging scenarios without deliberate intention. Accordingly, it is reasonable to assume a hierarchical relationship among the parameters, such that $\beta_A > \beta_I$ Furthermore, since the interaction term $A{\cdot}I$ is numerically greater than either A or I alone, the corresponding parameter $\beta_{I\cdot A}$ is constrained to be smaller than both β_A and β_I to preserve proportionality. For mathematical simplicity and theoretical consistency, the interaction parameter is thus defined as $\beta_{I,\cdot A} = \beta_I^2$. This is a modeling assumption introduced for tractability and should be reined or validated in future empirical work.

Based on these constraints, a provisional value for the primary parameter is selected as β_A = 0.085 and the assumed parameter hierarchy implies that $\beta_I \approx 0.013239875$ and by definition: $\beta_{I\cdot A} = \beta_I^2 \approx 0.000175294$.[16] Under the earlier assumption of no spatial dependence (d = 0), the consciousness-related contribution after substituting the parameter values is given by: 0.085 × 10 + 0.013239875 × 10 + 0.000175294 × 10 × 10 ≈ 1.

The normalization factor in the model is also given by $6/(1 + 1/n)$, which clearly converges to 6 as $n \to \infty$, since $1/n \to 0$. Substituting these results into the simplified model yields:

$$|E_{RNG}| \approx 6 \cdot \frac{n}{1+n} + |\varepsilon|,$$

from which it follows that: $\lim_{n\to\infty} |E_{RNG}| = 6$.

Thus, the selected parameters ensure that the model converges to the desired theoretical limit under conditions of maximum cognitive influence. In the absence of any such influences, the model naturally reduces to the baseline stochastic behavior, as expected from RNG systems.

Estimating the Distance Decay Parameter α

Having established the parameters governing the magnitude of consciousness-related influences (β_C) and demonstrated the convergence behavior of the model under idealized conditions, the next step is to estimate the spatial decay parameter α. Although α is ultimately an empirical parameter, useful guidance can be drawn from earlier experimental research that systematically examined the distance dependence of consciousness-related effects.

A particularly relevant study is the 12-year investigation conducted by the Princeton Engineering Anomalies Research (PEAR) laboratory (Jahn et al., 1997), which assessed whether human intention could measurably influence the output of a random event generator (REG). The study compiled over 2.5 million trials, involving more than 100 participants performing structured tasks under controlled laboratory conditions.

The trials were carried out under two primary spatial arrangements: local trials, in which the participants were physically located close to the REG device (at distances of 2 to 10 meters); and remote trials, conducted at distances

ranging from several hundred to thousands of kilometers. The experimental design included three conditions: a high intention state (HI), where participants attempted to increase the frequency of 1s; a low intention state (LO), aimed at increasing the frequency of 0s; and a contrast condition, measuring the net difference between the two. Across all conditions, statistically significant deviations from randomness were observed.

To assess whether spatial separation influenced these effects, the data set was stratified into local and remote trials. In the 522 series of local HI trials, participants achieved a Z score of 3.809, corresponding to an effect size of 20.8×10^{-5} per bit across 3.35×10^{8} samples. In comparison, the 212 series of remote HI trials produced a Z-score of 2.214, with an effect size of 16.4×10^{-5} per bit over 1.83×10^{8} samples. These results suggest a modest reduction in effect size with increasing distance, although statistically significant deviations from randomness were present in both spatial conditions.

While the difference is modest, it could still indicate a distance-sensitive mechanism particularly given that small effects can accumulate meaningfully across large data sets. As such, it is used here and explored within the context of the proposed CESM framework.

Applying the simplified version of the model (Equation 5) to quantify this distance dependence, it is found that setting $\alpha = 0.000004$ yields a consistent combined intention and attention value of $I = A \approx 6.32$, under both local and remote conditions. This analysis suggests that, while the core intentional influence on RNG output remains robust across distance, the attentional component of cognitive engagement may exhibit a mild decline as spatial separation increase.

However, it is important to explicitly acknowledge that the empirical estimation for the distance decay parameter presented here remains uncertain. Future studies should empirically verify this value and explore alternative functional forms to further clarify this aspect of CESM.

APPENDIX B

CESM AND THE GLOBAL CONSCIOUSNESS PROJECT

Empirical findings from the Global Consciousness Project (GCP) suggest that, during major world events, random number generators (RNGs) distributed across the globe sometimes display correlated deviations in unison (Nelson, 2002, 2020, 2021). This appendix illustrates how the Bayesian and information-theoretic principles underlying CESM from the main text can account for these global correlations, provided that large numbers of individuals experience heightened attention simultaneously.

Equation (1) in the main text establishes the baseline entropy of an ideally random RNG, while Equation (2) shows how each new act of cognitive engagement (e.g., heightened emotion and attention or intention, interpreted as an "observation") could update the RNG's probability distribution. In this framework, the "observation" in Equation (2) should be interpreted in a Bayesian sense, that is as an informational update rather than a literal observation of the RNG. Equation (4) makes this idea operational by introducing measurable cognitive parameters such as attention (A) and intention (I).

In the context of the Global Consciousness Project (GCP), I is typically set to zero as participants in general are unaware of the RNG network and therefore exert no deliberate mental effort to influence it. However, emotionally modulated attentional presence (A) may still be significant, especially during global events that evoke widespread emotional engagement.

As reflected in equations (4) and (5), the aggregate impact on RNG outputs can increase with the number of individuals affected, consistent with the GCP's core hypothesis that large-scale emotional coherence may correspond with measurable entropy shifts. These concepts extend naturally to global scenarios involving mass participation or shared emotional focus:

- Instead of a small local group (unconsciously) affecting a single RNG, thousands or even millions of people may each contribute small, simultaneous informational "nudges," provided they share a heightened attentional state.
- When a widespread event trigger distributed attention, correlated deviations can arise at multiple RNGs, even those geographically distant, because each device responds independently to the same globally shared cognitive effect.

When applying the CESM framework to Global Consciousness Project (GCP) data, it can be assumed that participants direct their attention and emotional engagement toward the event itself, rather than the RNG devices. This mirrors the setup used in the experiment described in the main text. Because participants are generally unaware of the RNGs, they cannot deliberately try to influence them through intention. Instead, any observed effects are interpreted as the result of shared emotional attention, with the RNGs responding indirectly to a widely distributed cognitive or emotional state. From this perspective, correlations in RNG outputs are not due to communication between devices, but rather to a common informational influence affecting all of them.

From an information-theoretic perspective, each instance of emotional attentional presence, when an individual becomes cognitively and affectively engaged with an engaging event, can contribute a slight reduction in the entropy of an RNG. During major global events, the simultaneous emergence of such "attentional updates" across large populations may collectively bias the output of geographically dispersed devices. The resulting nonrandom shift manifests as a weak but measurable correlation among RNGs, consistent with the CESM hypothesis that shared emotional engagement can act as a distributed informational constraint on stochastic systems.

In CESM, distance is incorporated through the exponential decay term ($e^{\alpha \cdot d}$), where $\alpha \geq 0$ governs how the effect decreases with spatial separation. Two main scenarios help illustrate how this related to the GCP experiments:

- If $\alpha = 0$: All participants contribute equally to the RNG's entropy shift, regardless of where they are located. This yields a distance-independent model.
- If $\alpha > 0$: Participants exert diminishing influence as their distance from a given RNG increases.

For truly global events (e.g., the September 11 attacks or the onset of the COVID-19 pandemic), the engaged population tends to be broadly distributed worldwide, with no single geographic center dominating. Approximating $\alpha \approx 0$ may therefore be practical, since network-wide coherence in RNG output can appear uniform across large distances. In such cases, each RNG is locally responding to a surge of collective attention rather than direct inter-device signaling. Importantly, observing globally correlated deviations does not exclude a small but non-zero α; it only indicates that any distance effect is overshadowed by the widespread emotional or cognitive engagement.

In contrast, for more localized or region-specific events, using $\alpha > 0$ allows greater nuance. Participants near the emotional epicenter of the event may experience stronger emotional resonance, thereby influencing nearby RNGs more strongly. Distant RNGs can still register an effect but to a lesser extent. This behavior is testable: if RNGs closer to the event show stronger deviations, it supports $\alpha > 0$; if deviations are uniform regardless of distance, $\alpha = 0$ becomes the more likely scenario.

Preliminary evidence for spatial structure in GCP data was reported by Nelson et al. (2002), who noted that deviations in RNG output occasionally appeared stronger for devices located nearer to the emotional epicenter of a global event. A later analysis by Nelson and Bancel (2011) conducted a regression across inter-device distances and found a small but statistically significant decline in network synchrony as spatial separation increased, with results suggesting that geographic distance may affect the strength of correlated deviations. While these findings support the idea of distance-sensitive effects, no formal exponential decay model has been proposed or tested within the GCP framework. The CESM parameter α introduced here therefore offers a novel formalization of this hypothesis, allowing distance-based attenuation to be modeled explicitly and tested empirically in future analyses.

In practice, small but non-zero values of α can still produce a measurable distance decay. For example, setting $\alpha \approx 0.000004$, as in the main text, implies that the RNG effect falls to half its original value only after roughly 173 km (about 108 miles). This seemingly modest effect can still matter for global projects like the GCP. If an emotionally intense event increases collective attention (with $I = 0$ but high A) among millions or billions of people, the model predicts a statistically robust shift if those individuals are on average near the RNGs. However, when average distances grow beyond a few hundred kilometers, the predicted effect may drop below detection thresholds. As a result, major events in more remote regions might not show up clearly in GCP data if the RNG network lacks geographical coverage.

Future analyses could refine the GCP methodology by introducing distance-sensitive weighting. For instance, RNGs could be grouped into geographic clusters, and effect sizes compared across regions. If closer clusters consistently exhibit larger deviations, this will support $\alpha > 0$. If no such pattern emerges, the simpler model with $\alpha = 0$ may be sufficient, and a revision of the CESM would then be warranted. In fact, the analysis done by the GCP could in principle be used to determine a more exact value of α, which is an interesting avenue for future research to explore.

APPENDIX C

XOR WHITENING AND BIAS PERSISTENCE

In the experiment described in the main text, a TrueRNG v3 device was used. This device generates true random numbers based on the avalanche effect in a semiconductor junction and applies a firmware-based whitening process to the raw entropy stream before writing output to disk. The purpose of this whitening step is to suppress local bias and enhance short-term entropy. A natural concern is whether such preprocessing might obscure the type of structured deviations predicted by CESM. This appendix clarifies how the whitening procedure operates, how it interacts with bias and temporal correlation, and why long-window deviations remain theoretically and empirically detectable.

The whitening technique employed by the TrueRNG v3 is based on the XOR (exclusive OR) operation, a binary function defined as:

$$X_1 \otimes X_2 = \begin{cases} 1, & if\ X_1 \neq X_2 \\ 0, & if\ X_1 = X_2 \end{cases}.$$

When applied to two independent biased bits X_1, X_2 ~ *Bernoulli*(p), the resulting output $Y = X_1 \otimes X_2$ has an expected value $P(Y = 1) = 2p(1-p)$ which is maximized when $p = 0.5$. As such, the XOR operation suppresses direct bias and drives the output toward uniformity.

According to the manufacturer, the TrueRNG v3 device uses a firmware-based XOR whitening method to process its raw bitstream. The whitening algorithm operates on fixed-length blocks of 20 consecutive raw bits, which are sampled sequentially from the underlying entropy source. For each such block, a single output bit is produced by computing the XOR (exclusive OR) across all 20 bits:

$$Y = X_1 \otimes X_2 \otimes \cdots \otimes X_{20}.$$

This operation is then repeated for the next block of 20 bits, meaning the output sequence is constructed from non-overlapping windows of raw data as Y_1 is based on X_1 through X_{20}, Y_2 is on X_{21} through X_{40}, and so on.

The XOR function returns 1 if the number of 1s in the block is odd, and 0 otherwise. Consequently, the whitening process aims to eliminate systematic biases by making the output less sensitive to any consistent skew in the input bits. If the raw bits are assumed to be independent and identically distributed (i.i.d.) with a fixed bias p, the probability that the XOR output is 1 corresponds to the probability of an odd number of ones in a 20-bit binomial distribution. Formally, this is given by:

$$P(Y=1) = \sum_{\substack{k=1 \\ k\ odd}}^{20} \binom{20}{k} p^k (1-p)^{20-k}.$$

For instance, if $p = 0.55$, the resulting probability becomes $P(Y = 1) \approx 0.5000000000000044$, which is effectively indistinguishable from fair coin tosses. Therefore, under i.i.d. conditions, the XOR whitening process effectively suppresses visible bias in the output stream.

However, this conclusion no longer holds when temporal dependencies are present in the raw entropy stream, as might occur if the device is influenced by cognitive factors. If the bit sequence $\{X_t\}$ is governed by, for example, a first-order Markov process, where the value of each bit depends probabilistically on the previous one, the assumption of independence breaks down. In such cases, the effective number of independent bits within a 20-bit XOR window is reduced.

To illustrate how such structured bias can persist through XOR whitening, consider a raw bitstream with a sustained bias of p=0.55 and a lag-one autocorrelation of ρ=0.80. Following Bartlett's formula for autocorrelated sequences (Bartlett, 1935), the effective number of independent observations in each 20-bit XOR window is reduced to:

$$e_{eff} = 20 \cdot \left(\frac{1 - \rho}{1 + \rho} \right) = 20 \cdot \left(\frac{1 - 0.8}{1 + 0.8} \right) \approx 2.22.$$

The analytical approximation for the expected mean of the XOR-whitened output under this autocorrelated bias is given by:

$$\mathbb{E}[Y] \approx 0.5 - e_{eff} \cdot (p - 0.5)^2 = 0.5 - 2.22 \cdot 0.0025 = 0.4944.$$

Thus, the expected shift from 0.5 is approximately -0.0056 after whitening. As such, under these conditions, the whitening procedure no longer fully eliminates structured dependencies.

To test whether this shift is statistically detectable, the standard error of the mean over n=100,000 samples, assuming a Bernoulli variance under the null, is given by:

$$SEM = \frac{0.5}{\sqrt{100,000}} \approx 0.00158,$$

with a corresponding z-score of:

$$z = \frac{-0.0056}{0.00158} \approx -3.51.$$

This yields a two-tailed p-value of approximately 0.00044, well below the 1% significance threshold. Thus, a persistent and autocorrelated bias in the raw stream when aggregated over 100,000 samples, leads to a statistically significant deviation.

This limitation of the XOR whitening procedure is central to the findings reported in the experiment in the main text, where long-window deviations are found to be highly significant as they do not only persist after whitening but also align with the predictions of the Cognitive Entropy Shift Model (CESM).

APPENDIX D

EXPERIMENTAL DESIGN AND PROTOCOL

This appendix details the full experimental setup, participant information, data filtering procedure, and modeling framework used in the experiment described in main text.

Study Setting

The study was conducted continuously over a two-year period, from June 2021 to June 2023, in a private apartment located in central Stockholm, Sweden. The building was situated next to a city park and directly close to a local high school, which began daily activities at 08:15. The apartment housed four individuals, but only three were considered participants in the study: either the author or his spouse (depending on the day), and their two young children, aged 8 and 5 at the start of the observation period. These three individuals were typically present in the apartment during the relevant time windows, particularly during emotionally engaging morning routines. The children were unaware that an experiment was taking place, ensuring that no expectancy effects or demand characteristics influenced their behavior. No instructions were given, and no active involvement was required beyond ordinary daily activities.

Device and Data

A TrueRNG v3 device was installed inside a TV bench in the apartment's living room (see Figure 5), which measured approximately 25 square meters and featured overhead skylights. The device remained in a fixed position throughout the study. It was powered continuously and connected to a Raspberry Pi 400 microcomputer, which timestamped and recorded the device's output in real time. The generated bitstream was XOR-whitened internally using fixed-length blocks of 20 raw bits sampled sequentially from the entropy source, which helps to reduce local bias while preserving longer-range statistical features (see Appendix C for more detail). One data point per second was generated using a batch script, while the underlying raw entropy stream was logged at 256 bytes per second.

Identification of High-Attention Periods

High-attention periods were identified prior to the data collection and analysis based on well-established

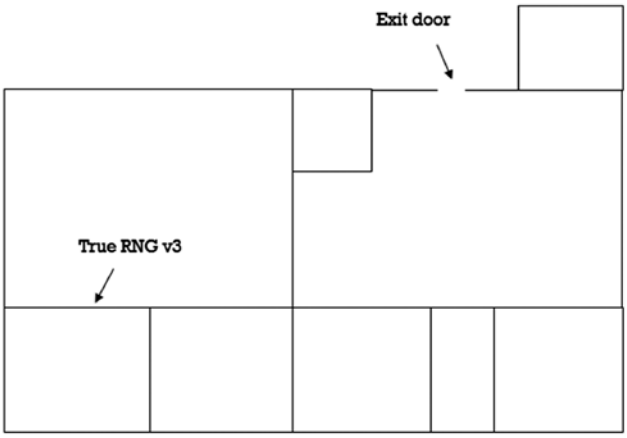

Figure 5. Schematic Drawing Over the Apartment.

household routines, daily school departure schedules, and firsthand knowledge of the participants' behavior. Specifically, the period between 07:30 and 08:15 on weekday mornings was predictably marked by emotionally engaging activity, such as preparing two young children for school under time constraints. These moments reliably involved frequent interpersonal interaction, conflicting wills and mild time pressure, all of which contributed to a state of collective emotional intensity and shared attentional focus. Although no formal logging of cognitive states was conducted, this period clearly stood out as a natural and recurrent window for studying potential effects of heightened emotional and cognitive engagement. Accordingly, the time windows were pre-designated based on lived experience and later matched with timestamped RNG data for statistical analysis.

Data Filtering and Subsampling

In total, the RNG device generated 47,731,465 valid one-second samples over the study period, corresponding to approximately 552.4 days, or 18.4 months assuming a 30-day month. This reflects the total span of continuous recording time prior to data filtering, as data also from weekends where included. Technical malfunctions such as power interruptions, bitstream errors, or corrupted write operations were identified through log inspection and excluded. A second filtering step removed all intervals during which participants were confirmed absent or their location was uncertain, based on travel records, household calendars, and retrospective observational notes. After this filtering, 38,941,850 valid one-second samples were obtained, corresponding to approximately 450.6 days or 15.0 months. For empirical analysis, 1,136,553 valid seconds were identified within the recurring 07:30–08:15

morning window, amounting to approximately 13.2 days of accumulated data across the two-year period. This 45-minute period was also divided into three non-overlapping 15-minute intervals: 07:30–07:45 (411,242 seconds), 07:45–08:00 (389,082 seconds), and 08:00–08:15 (434,059 seconds). Additionally, a more narrowly defined subsample covering the most emotionally intense interval, 07:55–08:10 (410,357 seconds), was compared to a post-departure control period from 08:10 to 08:25 (394,016 seconds), which overlapped with the start of the school day but occurred after participants had left the apartment. These subsets formed the empirical foundation for testing the hypothesis that structured cognitive-emotional states may induce measurable shifts in entropy in a physical random number generator.

Spatial Proximity

To further interpret the relationship between emotional proximity and entropy patterns, spatial distance was estimated using straight-line physical separation (in meters) between participants and the RNG device, derived from floor plans and direct measurements of the apartment layout. During the early part of the target morning window (07:30–07:45), participants typically remained in their bedrooms or adjacent areas, resulting in short distances of approximately 1 to 5 meters. Later segments (07:45–08:15) involved movement toward and eventually out through the apartment door, increasing the physical distance to around 10 meters during peak engagement. These within-day spatial variations provided additional context for evaluating how movements around the device, proximity and attentional intensity may have contributed to the observed deviations in the RNG output.

Environmental Controls and Artifacts

Finally, it should be noted that a television located near the device was never used during the relevant time windows, minimizing the potential for audiovisual or electromagnetic interference. No major modifications were made to the physical environment during the study period and room temperature and electrical stability were monitored passively. While the skylights occasionally caused elevated indoor temperatures on sunny summer days, these periods mostly coincided with the participants being away from Stockholm for vacation. Such intervals were analyzed separately and showed no measurable deviation from chance, effectively ruling out temperature fluctuations or environmental drift as explanatory factors.

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RESEARCH ARTICLE

Vapor Phase Electrochemistry 4: Cylindrical Air Plasmas

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ABSTRACT

The most puzzling of all atmospheric phenomena are probably UFOs (Unpredictable Flying Objects). Earth-lights are similar but they are smaller and far less familiar. An electrochemical model that explains all the characteristics of ball lightning now can explain most characteristics of UFO and earth-lights. Despite their very different appearances, all three phenomena owe their structural stability to exactly the same forces. The fact that UFOs usually appear to be largely metallic while lightning balls usually glow brightly is easily explained. However, one characteristic of UFOs seems never to have been reported for lightning balls. This is prolonged tracking of an aircraft while a kilometer or more away from it. It is shown here that assuming the chemistry to be the same in all three structures can fully explain (qualitatively) how the same forces hold several air plasmas together. The most familiar cylindrical plasmas are lightning bolts, but still little is understood about the earliest (invisible) stages of air breakdown which rapidly produce the so-called stepped leaders that then lead to conspicuous lightning strokes. It seems that long thin air plasmas, similar to the invisible early lightning precursors can explain the tracking of aircraft by UFOs. Similar invisible plasmas can also explain why roughly horizontal lightning discharges are so common. An additional requirement for the existence of long, horizontal air plasmas is probably near perfect charge neutrality over the whole length of the invisible cylindrical plasma. Modeling only the physical aspects of the processes (for mutual UFO interactions) could prove feasible and might help improve our understanding of all naturally contained air plasmas: spherical, spheroidal and cylindrical.

KEYWORDS

UFOs, earthlights, ball lightning, air plasmas, tracking, electrochemistry.

INTRODUCTION: NATURALLY CONTAINED AIR PLASMAS

Ball lightning is the simplest form of contained air plasma and about 10,000 accounts of its behavior had been reported to scientists by 2002 (Singer, 2002). These accounts go back many centuries and a good fraction of the sightings were witnessed by several individuals. Many people are unfamiliar with even the existence of ball lightning let alone all its strange properties. Taken together, its wide variety of puzzling characteristics have long been seen as anomalous in that, in combination, they appear to violate some well-established laws of physics.

Numerous models have been proposed that can explain *a* few ball lightning characteristics but no early

model could explain them all. This situation changed significantly when the Russian physicist, Stakhanov (1979) published a model that was based on what he called his cluster hypothesis - the clusters being hydrated ions. This model could account for nearly all of the apparently anomalous characteristics of ball lightning and it was the first one that even attempted to do so. The model was improved and extended between 1994 and 2002 (Turner, 1994, 1996a, 1996b, 1997a, 1997b, 1998, 2001, 2002) by which time it was quite clear that ball lightning is a single phenomenon that violates no known law of physics. A much more detailed justification of this claim was provided recently (Turner, 2023).

It has also recently been shown that air plasmas can combine together in tight groups, each of which behaves precisely as if were a lightning ball (Turner, 2024). The extensive studies of earth-lights that were made over more than two decades in the Hessdalen valley of Norway (Teodorani, 2004) showed the apparent structural connection that exists between lightning balls and UFOs.

The earlier mentioned improvements to Stakhanov's ball lightning model were made possible because it was already clear, to a few chemists working in support of the electricity supply industry, (Gates et al., 1982; Turner, 1980, 1983, 1987, 1988, 1990; Wood et al., 1983) that no valid theory exists that applies to the chemistry of ions in a moist gas. The later improvements to Stakhanov's 1979 model were based on a simple acceptance of this fact and then finding a way to circumvent it (Turner, 2023, 2024). Recently, experimental evidence supporting key elements of the electrochemical model have been reported (Bartlett & Turner, 2025).

One of the longstanding beliefs of some physicists interested in ball lightning is that the so-called virial theorem excludes the possibility that naturally contained air plasmas can exist (Singer, 1971). The theorem has proved very useful in many fields of physics and engineering (Collins, 1978; Singer, 1971). However, it ignores the possible presence of chemically produced forces. The mere existence of flames (where the inflow of air holds the plasma of a flame together) might have made it clear (though it did not) that such arguments are irrelevant when chemically derived forces are present (Turner, 2024).

A convenient way of thinking about air plasmas is that they burn nitrogen instead of a hydrocarbon gas. The reason these plasmas are so rare is that the plasma surface needs to be refrigerated. This is because nitrogen "combustion" is only thermodynamically possible below a temperature of 15 °C (Turner, 1998). Physical and chemical conditions favoring the refrigeration process rarely happen to be optimal (Turner, 2024). The impurity content of the air, for example, has to be optimal as do the local relative humidity and electric fields. Our repeated failures to prepare these plasmas under laboratory conditions result from our ignorance as to what exactly these optimal conditions are.

Stakhanov (1979) based his model on well-established ball lightning accounts plus many new accounts supplied to him following his request for such reports in a popular Russian science magazine. In his 1979 book, he reviewed all the apparently anomalous characteristics of ball lightning and provided a largely electrochemical explanation for most of them. However, his model could not explain the most energetic plasma balls reported. Nor could it explain the origin of one essential ingredient of the model: a surface tension for the plasma ball.

He had estimated a range of reasonable magnitudes for the surface tension of the balls from such reported characteristics as bouncing and squeezing through holes much smaller than the balls themselves. The inability to explain this apparent surface tension was clearly the least satisfactory aspect of the model since it is essential in explaining both the recovery of a plasma ball from a distortion and how the hydrated ions of the plasma could be kept separate from the air that surrounds the ball.

By 1993 it had been realized, by a small number of chemists in, or supporting, the electric power industry that there are serious theoretical limitations in modeling ions in water anywhere near the fluid's critical point. This is at a temperature of 374 °C and a pressure of 221 bar (0.1 MPa or 221 times atmospheric pressure). Detailed descriptions of these difficulties are provided elsewhere (Turner, 2003). Related limitations make it impossible to quantify the properties of ions in moist air and so in all natural air plasmas (Turner, 2023). This fact was first pointed out much earlier (Chown, 1993).

The most concise way of clarifying these limitations is to note our current inability to quantify the consequences of electrostriction of water molecules in the huge electric fields near to any ion in a moist gas. It had early seemed likely that this problem and the limitations of Stakhanov's (1979) ball lightning model were related. Stakhanov based his model on measurements of the hydration thermodynamics of the ions that he thought would be present. In support of his model, he pointed out that ion clusters exist as stable entities in the ionosphere (Narcisi

& Bailey, 1965). The thermodynamic measurements had (of necessity) all been carried out at very low gas pressures. As a result, in none of the thermodynamic studies were any data obtainable for hydration numbers greater than seven.

It later proved possible (Turner, 1994) to obtain data for much more heavily hydrated ions by simply interpolating between the mass spectrometry data available and those for aqueous solutions containing the same ions. This approach was used following an earlier observation that the gas phase thermodynamic properties of ions seemed to be fully consistent with those available for aqueous solutions containing the same ions (Kebarle, 1974). This exercise led directly to the basic improved version (Turner, 1994) of Stakhanov's (1979) model for ball lightning.

Using this approach, most of the apparently anomalous characteristics of ball lightning were easily explained qualitatively. However, as had been demonstrated clearly by 1990 (Turner, 1980, 1983, 1988, 1990), very few properties can be known quantitatively. This is because of a range of connected knowledge gaps that result from our totally inadequate understanding of electrochemistry in a moist gas (Turner, 2023). Serious consequences of this problem had first been uncovered as a result of some industrial problems where a very compressible fluid (steam) was involved (Turner, 1987). Later it was realized that the same phenomena restrict what can be modeled (validly) in moist air (Turner, 1994).

By 1998, it was clear that ball lightning can extract chemical energy from the air (Turner, 1998) and it was eventually found that all the characteristics of the phenomenon are explicable - though only qualitatively (Turner, 2002, 2003). It can now also be seen that the structure of no other known form of air plasma, including variously shaped UFOs, is in any way anomalous (Turner, 2024). Still more recently, experimental support for the most important assumptions in the 1994 ball lightning model was reported (Bartlet & Turner, 2025). Fortunately, even in the absence of valid theories, all the qualitative characteristics of air plasmas can be explained.

OBSERVATIONS OF UFOS (UNPREDICTABLE FLYING OBJECTS) AND RELATED AREAS OF CONFUSION

The whole subject of UFOs is controversial. This is despite the large quantity of evidence supplied by aircraft pilots. They occasionally claim to have been tracked by metallic looking objects, sometimes at a very long range. In addition, frequent claims are made that these objects can move at speeds that no conventional aircraft could possibly match. In an early book on UFOs, Klass (1968) collected together a variety of evidence demonstrating that UFOs and ball lightning are both air plasmas and therefore, he claimed, he had explained UFOs. The only valid criticism of this conclusion is that any similarity between lightning balls and UFOs does not represent a complete solution to the problem since the former objects are themselves poorly understood. In fact, much earlier than this, Galli (1910) simply assumed that a single phenomenon exists, whatever its' shape. The shapes included cylinders, cones, prisms and plates.

In practice, the apparent violations of the laws of physics, with both ball lightning and UFOs have contributed significantly not only to confusion but also to the inhibition of research on both ball lightning and UFOs (e.g. Hynek, 1972, 2020; Sturrock, 1999; Turner, 2023, 2024). Excessive specialization has not helped either (Smirnov, 2000; Turner, 2001, 2002) and a variety of other societal problems has made matters worse (Turner, 2023).

It now seems clear that Klass's kind of logical, though purely qualitative, arguments can all be seen as realistic once it is acknowledged that vapor phase electrochemistry has never been brought to a state of development where quantifiable predictions are possible (see Turner, 2023). Evidence for the existence and characteristics of UFOs (e.g. Chester, 2007; Haines, 1994; Hynek, 1972, 2020; Kean, 2010; Smith, 1997; Vallee, 1965, 1993) is so strong that many serious investigators of UFOs find it necessary to invoke alien visitations or at least some unrecognized new mental phenomenon (Hynek, 2020). However, these claimed possibilities are not, in fact, the real problem. This is that we do not adequately understand the laws that govern almost any aspect of naturally contained air plasmas (Turner, 2023). Nor do most physicists realize the significance of the fact that a crucial part of physical chemistry is missing.

Possibly, the most unbelievable aspects of UFOs are accounts of sudden bursts of velocity (either speed or direction) that seem impossibly high. The speeds sometimes claimed would certainly be absurdly high if UFOs are solid. Since they are almost certainly balls of plasma, their velocities will be limited only by the speeds of molecules, which are extremely high (Turner, 2024). Also, air plasmas can be surrounded by thick mist (Haines, 1994) so that the

strongly reflective surfaces of UFOs must really consist of fine water droplets - not a metal.

All the most seemingly impossible characteristics of the 473 UFO cases considered by Haines (1994) are explicable on the above basis. Rapid UFO motion, for example, would be produced as a reactive force that resembles the force of a jet engine but in the opposite direction. Air can enter a UFO most rapidly on any side of an individual plasma ball whose containing aerosols are smaller (or less numerous) locally than on the other sides of the ball (Turner, 1994, 1996a, 2001). Sudden changes in direction should not be surprising either since air contaminants unfavorable to surface stability will be invisible. Also, a group of insects swept into the UFO could have a huge effect. The few reliable records of UFO speeds, obtained from radar reflections (e.g. Hynek, 1972), seem consistent with these suggestions.

As mentioned earlier, the study of ball lightning and the study of UFOs are nominally similar in that almost all the direct evidence we have comes from witness testimony. This fact introduces concerns over the reliability of the evidence in both cases - but this is a minor problem. There is a far more important sociological effect: our longstanding need for specialization. One result has been that the influence of chemistry in air plasma stability has been almost totally ignored (Turner, 2002). Ball lightning has long been of interest to a minority of physicists, engineers and meteorologists and over 2,500 papers on the subject had been written by the end of the twentieth century (Stenhoff, 1999).

There appear to be several reasons why UFOs have been taken less seriously than ball lightning, some of which have been discussed recently (Turner, 2023, 2024). One problem with UFOs probably results from the very large sizes of some of the objects and their seemingly very advanced methods of propulsion and navigation. This hints at the possibility that either enemy aircraft or aliens are involved.

As a consequence, there is the very serious problem, first raised clearly by Hynek (1972), that military personnel, in many of the world's air forces, have been far more interested in the phenomenon than have most scientists. Despite this problem, and despite the large amounts of nonsense to be found in many books on UFOs, reputable scientists and laymen have written a few extremely informative books on the subject (e.g. Chester, 2007; Haines, 1994; Hynek, 1972; Kean, 2010; Smith, 1997; Vallee, 1965, 1993).

In contrast with the best studies of ball lightning, which tend to agree over almost all the facts (if not what they mean) the diverse characteristics available on UFOs makes it easy to understand why the coverage given to them has been so varied. Many of the claimed facts concerning the two phenomena are very similar but the basic problems, with both ball lightning and UFOs, tend to be viewed in quite different ways by people with different backgrounds. A common feature of the more rational books on UFOs is that, however hard they try, most authors cannot help revealing their beliefs. For these non-sceptics, this usually involves somewhat vaguely described suspicions of alien visitations.

The present approach does not need to invoke aliens. However, in order to explain all the reliable witness testimony, it is necessary to assume the presence of invisible plasmas connecting either multiple UFOs or one UFO and an aircraft. Many accounts have been reported of aircraft being tracked by groups of UFOs usually, it seems, with the UFOs at fixed distance apart (Haines, 1994). It is assumed here that the most instructive interactions are likely to be those between two UFOs - because the presence of a metallic aircraft cannot then complicate the arguments.

If long thin cylindrical plasmas connect two groupings of air plasma the connections would probably resemble the long thin plasmas first studied experimentally by Thomson (1893) and subsequently by many other physicists (Loeb, 1965). These studies (in well evacuated vessels) showed that faintly luminous glows can be transmitted at about a third of the speed of light but no-one seems to have found a way of using these findings in order to make useful quantitative predictions in lightning studies (Rakov & Uman, 2003). Even if such attempts had been made, they might well have been invalid because of the basic science that is missing (Turner, 2023).

THEORETICAL LIMITATIONS IN AIR PLASMA SCIENCE

We now need to address the nature of the most basic problem that restricts what can be validly calculated in a moist gas. In the 1980s, it gradually became clear to a few chemists working for the electric power industry in several countries, that the thermodynamic properties of ions, dissolved in the fluid phases near to water's critical point, are impossible to quantify realistically (Gates et al., 1982; Turner, 1980, 1983, 1987, 1988; Wood et al., 1983).

Later it was realized that this should be equally true of ions in moist air and this realization led to the improved version of Stakhanov's (1979) model for ball lightning (Turner, 1994). Seriously mistaken conclusions are inevitable if it is assumed that ion concentrations govern reaction

rates when it is really ion activities that govern them (Glasstone et al., 1941). This means that there is no valid way of calculating either the kinetics or the thermodynamics of processes involving real ions (those at finite concentrations) in moist air (Turner, 2002, 2003, 2023).

In any kind of chemical change, including the mutual charge neutralization of ions, it is normally assumed that the rate of the process is controlled by the collision frequency of the ions. However, this is not strictly true for any chemical change. All rates of chemical processes are really controlled by the need to minimize the total free energy in the system. This means that it is really the thermodynamic activities of the reactants, not their concentrations, that control how fast any chemical change will proceed. Usually, for convenience, it is assumed that concentrations control reaction rates but it has long been known that this is no more than an approximation (Glasstone et al., 1941).

Unless the reactants are ions, the differences between concentrations and activities are usually small. However, if reactants are sufficiently hydrated ions in a gas, activities and concentrations can bear no known relation to each other (e.g. Turner, 1983, 1994). In fact, if hydration is sufficiently great, the differences can be so large that charge neutralization is thermodynamically impossible (Turner, 1990). Rate processes involving ions in moist air will continue to be impossible to quantify until the basic electrochemical problems are addressed (Turner, 2024). This will not be soon (Turner, 2023).

As implied earlier, the restriction on quantifying the properties of ions in real air is a result of the electrostriction of water molecules in the huge electric fields near the ions. It thus transpires that there is nothing at all anomalous about the properties of any air plasma. It is only our inability to quantify validly relevant thermodynamic and kinetic properties that makes the properties of lightning balls appear so mysterious.

When the author first realized that this was a possibility (Turner, 1994), he was unavoidably led to invoke the electrochemistry of nitrous acid to explain the structure of lightning balls. This exercise was only possible because the nitrite ion happens to be one of the few molecular anions whose thermodynamic properties are known. The most surprising and crucial property of nitrous acid in the gas phase is that it can exist in a metastable, fully ionized, form that will cool a plasma surface as it changes from its metastable to its stable form. The important role for nitric acid formation was only realized later (Turner, 1998). The formation of this acid explains how some lightning balls can survive long after the high electric fields produced in thunderstorm have vanished. The plasmas are, in fact, extracting chemical energy from the air (Turner, 1998). Experimental confirmations of crucial aspects of the relevant electrochemistry have recently been published (Bartlett & Turner, 2025).

Air plasmas other than ball lightning might also require strong electric fields to bring them to life, but this seems not to be the case. Of all the poorly understood processes concerning natural air plasma formation, one of the least well understood is ion formation in the air. It seems certain that by no means all air plasmas require large electric fields to ignite them; population inversions (of electron energy states) that result from appropriate electromagnetic fields can sometimes substitute for a spark (Handel & Leitner, 1994). They may always be important.

Another problem is that the most abundant initiator of ion formation in the atmosphere is ultra-violet radiation. Ionization in the air by UV is now known to be greatly facilitated by the presence of small quantities of certain sulfur compounds (Svensmark et al., 2007) or of appropriate organic compounds (Kirkby et al., 2016). Obviously, this could be true of other chemical compounds as well. Any compound can be ionized if a source of sufficient energy is available and the presence of specific contaminants in the air might well be crucial in the ignition of most air plasmas. However, for a plasma ball to possess a long life, nitrogen must surely supply the fuel. We concentrate here on the nitrogen chemistry that appears to be necessary in providing long lives to air plasmas. First, a few comments are needed on aerosols, since it is in these that the acids involved in containing air plasmas are formed.

Aerosols have been modeled since the end of the 19th century. The dependence of equilibrium vapor pressure, at an aerosol surface, on its radius was estimated very early by Kelvin (Thomson, 1872). Thomson (1888) later approximated the influence of a central electric charge. A commonly used relationship for combining these two influences was, later still, employed to estimate the equilibrium vapor pressure of water as a function of the number of water molecules that can be held in the field of a singly charged ion (Turner, 1998). On the basis of this relationship, it was found that a singly charged ion would probably need to be hydrated by at least 30 water molecules before the droplet containing it would be thermodynamically stable.

With each water molecule added after this, the stabilities of the aerosols continue to increase unless the ionic charge is neutralized. Of course, no real charged aerosol

particle could continue adding water indefinitely without encountering other particles or molecules and some of these collisions might lead to rapid charge neutralization. We only possess a very rough picture of the very early stages of aerosol formation but we now know that charge neutralization, in some cases and in sufficiently large charged clusters, need not occur at all (Turner, 1998, 2023). We really know next to nothing about charged aerosols whose mole ratios of water to ion lie between about 5 or 6 and say 3.10^8 ! However, they do seem to be essential in stabilizing air plasmas (Turner, 1994).

THE EARLY STEPS LEADING TO LIGHTNING STROKES

In trying to understand more about invisible air plasmas, it is obvious that the earliest stages of air breakdown are important. Concerning these, Loeb (1965) has stressed the importance of Thomson's (1893) discovery of very fast moving, though very weak, pulses of light. Since then, vast numbers of studies related to lightning physics have been undertaken. These show how extremely complicated are the detailed processes involved in lightning initiation. The general picture established from the early studies of South African thunderstorms by Schonland (1932) has changed very little, but the detailed complications involved in all the stages of air breakdown have been greatly clarified since then (Dwyer et al., 2012; Rakov & Uman, 2003).

We now know that Loeb (1965) was correct that the early stages of air breakdown *can* involve extremely energetic pulses of radiation produced at the tips of so-called stepped leader strokes, where the electric fields are highest (Dwyer et al., 2012). There must surely be local chemical consequences of such UV pulses - and not only in the physical changes that can be measured remotely. In his very influential book on lightning, Uman (1969) commented on the generally unsuccessful attempts there have been to relate laboratory studies to field studies of natural lightning. On page 203 of this book, he made the following statement which seems to have influenced most later work (e.g. Rakov & Uman, 2003). It reads "The whole lamentable situation is well characterized by the various theories of the stepped leader.... In much of the lightning literature the words pilot leader and streamer have attained the status of explanations or theories. To name is not to explain."

The last statement is obviously true but this does not mean that all the laboratory studies that led the development of the ideas (such as those described by Loeb, 1965) are worthless or that they could never have led to more complete explanations of the earliest stages of electrical breakdown in the air *if* sufficient attention had been devoted to them. Some of the possible reasons that this kind of study has not been pursued in the past were pointed out fairly recently (Turner, 2023).

High energy photons produced in the earliest stages of air breakdown seem likely to be far more plentiful in sheet lightning than in forked lightning. This is partly because the energy density at the tip of a leader is so high compared with that in a conducting channel and partly because of the far larger volumes of air that seem to emit the radiation (as sheet lightning) during a thunderstorm. Sheet lightning can often be seen when a severe thunderstorm is viewed from a distance and sometimes only sheet lightning is visible for much of the time.

Experiments have shown that high energy UV radiation can produce aerosols containing both nitrous and nitric acid. The concentrations of both species are very low (Bartlett & Turner, 2025). The range of nitrate concentrations found in these experiments is actually quite close to (though somewhat larger than) the background levels of nitrate ions found in air that is unusually clean (Neubauer & Heumann, 1988). This similarity is unlikely to be a coincidence.

In the first paper in the present series (Turner, 2023), an attempt was made to identify most of the reasons why the science of vapor phase electrochemistry has been completely neglected over the last three decades. The main problem identified was that, as a result mainly of political decisions, it is no longer in anyone's interest to work on the various associated problems. The reasons seem to be very clear (e.g. Klein, 2014; Wolff, 2010).

Research that is unavoidably slow, expensive and very unlikely to bring short term financial benefit to any company, is no longer funded (Turner, 2023). The complete faith in the profit motive (which most clearly began to accelerate in the 1980s) has ensured that what small progress was once being made in the study of basic aqueous-phase electrochemistry has now ceased completely. Different factors have controlled studies in more obviously meteorological fields. For over two centuries, protecting people and property and saving money on expensive disaster relief following some catastrophe has been one of the most important driving forces for studies in meteorology. The areas of science that have most relevance in the present context all involve ions in moist air.

CHEMISTRY IN LIGHTNING INITIATION

The question most relevant to the matters discussed here is why so little attention has been given to the chemistry involved in thunderstorms. Apart from some very obvious practical difficulties, one answer seems to result from the need for individual scientists to make a living. This can only be achieved if the research on which they are engaged can be expected to make definable and significant progress within some clearly defined period of time. In the case of any really difficult study, such as that of lightning, there have to be clearly defined objectives and these can only be identified on the basis of what can be measured and what can be modeled. Of course, there is no guarantee that all the assumptions made in a model are valid - hence the accepted need for both modeling and measurement.

Lightning studies only began to make significant progress once new very high-speed photographic techniques had been developed and combined with electrical measurements on the ground (Schonland, 1932). As we have seen, subsequent progress has been considerable (Dwyer et al., 2012; Rakov & Uman, 2003; Uman, 1969). The most important advances have been made through extending the range of electromagnetic energies monitored during the studies. The study of artificially triggered lightning has also proved valuable. The fact that all the important processes occur remotely from the detectors and often behind thick clouds obviously makes the interpretation of the results obtained in real thunderstorms almost completely model dependent. Although some current models now seem to be generally accepted, not all are (Dwyer et al., 2012).

Regarding the chemical consequences of thunderstorms, we still know little more than that ozone and nitric acid are made somewhere inside thunderstorms (Goody, 1995) and that the radicals OH and HO_2, which could be their precursors, are also found there (Brune et al., 2021). How and where exactly the oxidation occurs can only be speculated. One very relevant fact that is now clear, is that nitric acid in the gas phase is thermodynamically stable only at temperatures below 15 °C (Turner, 1998). This means that the acid might form directly almost anywhere inside a thundercloud except in a visible lightning channel. More helpfully, we also know (Bartlett & Turner, 2025) that nitric acid forms easily in the presence of energetic UV in humid environments and it has long been suspected that pulses of this radiation are produced during the initial stages of air breakdown (Loeb, 1965).

The development of techniques for monitoring thunderstorms from space seem to confirm (if indirectly) current suspicions of where nitric acid is actually produced. These techniques have allowed what seem to be important conclusions to be drawn concerning the relationship between normal lightning and one of the less well-known forms of plasma that are produced well above thunderstorms. Close to the mesopause (beginning about 80km above Earth's surface) what are now termed elves can form. Their transient luminous properties are now reasonably well characterized. They are believed to be associated with gamma ray production during thunderstorms.

While the maximum current in the return stroke of normal lightning rarely exceeds 30 kA (Rakov & Uman, 2003) the peak current in the very brief intra-cloud discharges where gamma ray production is initiated can exceed 150 kA (Liu et al., 2017). The UV produced by these current pulses will inevitably create aerosols nearby - near the boundary between the conducting plasma and normal air. These aerosols will initially contain low levels of nitrous acid which are then rapidly oxidized to nitric acid (Bartlett & Turner, 2025). These processes presumably occur wherever nitric acid forms during thunderstorms. It is probable that most of the nitrates found in the air were originally formed, as aerosols, near where air breakdown first occurs and/or from the leader strokes which then go on to produce the return strokes that are so visually conspicuous.

Recent observations from the International Space Station identified the source of one gamma ray pulse that produced an elve. Several independent techniques provided a surprisingly precise estimate of the source of the gamma rays (Neubert et al., 2020): inside one small thundercloud. The cloud's area was about 20 km^2 and its maximum height above the ground was about 13 km. The position from which the gamma ray pulse came was about 1km below the cloud-top. The cloud was relatively small (Neubert et al., 2020) its area being less than a tenth that of a typical super-cell cloud. Its height means that it was well below the tropopause at its latitude (fairly near the equator) so that most of the nitric acid produced would have been eventually released into the troposphere and mixed with normal air.

This finding is clearly consistent with the implication (made above) that the background nitrate content in the air is maintained by its formation at the surfaces of lightning strokes. Nitric acid could be produced in a variety of ways from the nitrogen oxides formed during thunderstorms or from pollutants in the air. Most polluting oxide sources are

very local so that it is difficult to see why the nitric acid found in snowflakes in the Antarctic (Neubauer & Heumann, 1988) and in hailstones in the USA (Turner, 2023) should all have such similar concentrations of nitric acid if the acid is mainly formed from what are commonly called NOx pollutants. For these reasons, it now seems probable that the *b*ackground level of nitric acid, in both rain and in ice (Mason, 1971), originates mainly where the initial electrical breakdown of the air occurs. The use of drones, capable of detecting very dilute nitric acid in aerosols, might make it possible to determine whether or not most of the acid is produced very near lightning discharges. Clearly, it would also be necessary to know where precisely the preliminary lightning discharges were located. Hence this kind of study is unlikely to produce decisive results very quickly.

Here we are only directly concerned with the processes that produce electromagnetic radiation at the tips of the structures that Loeb (1965) and others used to call pilot leaders. They may be identical to the lightning precursors that Schonland (1932) called α stepped leaders. However, studies of the kind just mentioned might be able to throw new light on the earliest stages of air breakdown. These processes inevitably involve such low energies that they cannot normally be identified in the presence of all the high energy processes that we know arise during thunderstorms.

THE TRACKING OF MOVING OBJECTS BY NATURALLY CONTAINED AIR PLASMAS

Although the tracking of aircraft by UFOs is well established, *closely* similar tracking of vehicles at ground level is rarely reported. Far more frequently, when a UFO approaches a motor vehicle, instead of tracking it over significant distances, the UFO will cause the cars' ignition system to fail, the car will stop and it cannot be re-started until the UFO has departed (Hynek, 1972; Vallee, 1965). However, there has been at least one published account of the tracking of a moving vehicle by plasmas at ground level. This account (Anonymous, 1896) was summarized by Corliss (1977). Figure 1 provides a clear picture of the event (taken from Corliss's book). In this event, a German farmer had been driving along a narrow road in May 1896 when he encountered two glowing spheres of St. Elmo's fire.

Such spheres can be considered to be small tethered lightning balls (Turner, 2023). The following is quoted from the original article by Corliss (1977) on page 31: "his attention was attracted by a bright light behind him. On looking around he saw fire balls about the size of a man's hand

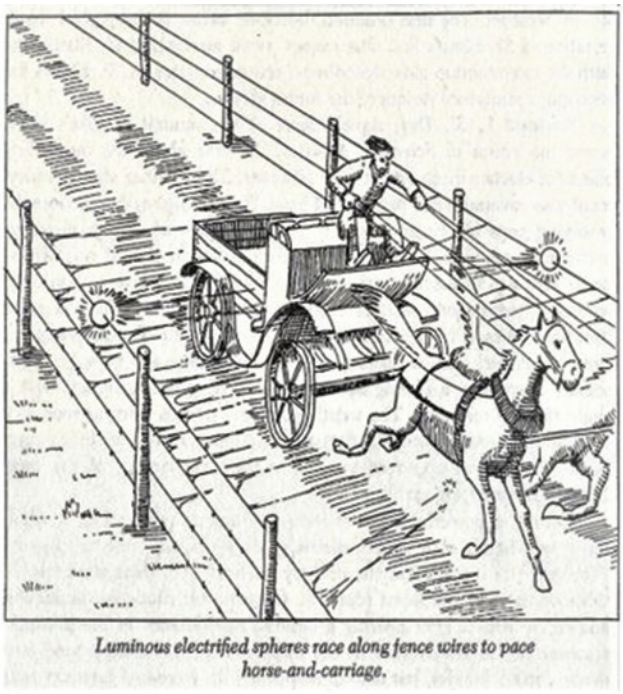

Figure 1. An Early Example of Vehicle Tracking by Air Plasmas. (Corliss, 1977).

traveling towards him along the wire on both sides. In a moment they were abreast of the carriage, and then traveled along with it *pari passu* (at an equal rate), while brush discharges and audible crackling, as from a large electrical machine, were observed to proceed from the fireballs towards, apparently, the iron parts of the carriage. Vibrations of the wires could be distinctly heard, and a torrent of sparks sprang over from the fences to the carriage and horses."

In this particular case, it might just be reasonable to assume that normal electrostatic forces, between the plasma balls and the carriage, were responsible for the observed tracking. However, the distance separating the wire and the carriage, if the sketch is to be believed, looks rather too large to be explained in this way. It is hardly possible that normal electrostatic forces could account for a somewhat similar experience that was reported to me nearly a century after this account by Jim Garrett. In 1993 Mr. Garrett had made contact after having read a brief, pre-publication, account of my 1994 ball lightning model in a popular science magazine (Zimmer, 1993).

In his letter he stated "I am fascinated with your explanation (of ball lightning) because for all these years I've wondered how a plasma could exist in free space without blowing itself apart". At the time of the observation, Mr. Garrett was studying electrical engineering but he was already somewhat experienced in the field. The

observation was made during a severe Oklahoma thunderstorm in 1963. He first saw (to the side of his car) a bright white light as lightning struck what would have been the ground cable of a power line. He then saw an initially green ball of plasma grow rapidly from what he took to be the point of impact of the lightning bolt.

Once the (rapidly changed to white) ball, of basketball size, had formed, it accelerated to match precisely the car's speed, *of* about 55 miles (98 km) per hour. It then tracked the car (to the side but slightly in front of it) for about half a mile. The ball moved as if floating directly above the wire, possibly just touching it. The distance from the car to the wire was roughly 20m. This is similar to the closest distances occasionally reported for encounters between an aircraft and a UFO (Chester, 2007).

In this case, the separations were so large that normal electrical driving forces could not have been responsible. The tracking distance was later confirmed when the site was re-visited. It would be interesting to know for certain that, in the 1896 incident, the plasma balls really were centered on the wires and not floating above them - as in Mr. Garrett's observation. There were other unexplained details in the Oklahoma sighting, such as why the ball remained vertically above the wire with no apparent tendency for a displacement either towards or away from the car. This seems to have surprised Mr. Garrett almost as much as the tracking itself. The ball's vertical position was almost certainly the result of a dominant dc field. Such fields are thought to explain what used to be called the electrostatic guidance of lightning balls (Turner, 1998).

Because of the distance from Mr. Garratt's car, it is far more difficult to understand how a plasma ball could track the car's motion in a mainly horizontal plain. This it did, however, the ball accurately maintaining its height above the cable as the latter rose and sank between its wooden support posts. Apart from a fairly precise estimate of the separation in this case, the main differences between these observations and the numerous pilots' reports of UFOs tracking aircraft is that, in the latter cases, the plasmas tend to be brighter, very much larger, frequently much more distant and not obviously in communication with any (even poorly) grounded object.

Normal electrical forces could not possibly be the explanation for the numerous cases in which experienced pilots have reported tracking by UFOs that, on first observation, were estimated to be kilometers away from the aircraft being tracked. It has certainly seemed, and it has often been claimed, that only an intelligent being could be responsible for this characteristic of UFOs. However, it will be argued here that there is probably a perfectly feasible way in which an air plasma can track an aircraft or several UFO plasmas can move in formation. The latter is a fairly common occurrence in reports of UFO encounters (Haines, 1994).

The numerous reports of UFOs tracking aircraft are so strange that most physicists do not even try to explain them. Most disbelievers simply ignore them. However, there also exists a small collection of UFO reports that seem quite impossible to dismiss out of hand (Sturrock, 1999). Accepting the advice of the very experienced UFO investigator, Jacques Vallee, Sturrock assembled a few convincing pieces of evidence in his book.

In doing so, he may have provided a somewhat similar service to the study of UFOs to that provided a century and a half earlier by Arago (1855) to future studies of ball lightning. At the time, Arago could do little more than let it be known that the phenomenon was real and was worth serious study. He clearly hoped that there could be some future benefit in showing that the phenomena are real. His view was apparently not shared by most of his professional contemporaries (Singer, 1971).

A particularly convincing and very detailed account, of an encounter with a UFO in Ohio, was described in Sturrock's book, in a chapter written by Zeidman (1999). Most of the astonishing details of this encounter, during which a helicopter was elevated high into the air by the UFO, have been discussed recently (Turner, 2024). Here we only need to mention the fact that this UFO, like many others, tracked the aircraft for some time well before the close encounter. There was far less detail on the early part of the tracking than on what occurred later but one of the crew members, of which there were four, first noticed the distant object. It was positively claimed to be tracking the helicopter only when the objects were a few km apart.

This would have been within the range of those remote UFO encounters that are most commonly reported in peacetime. Much smaller UFOs, the so-called "foo fighters", were frequently reported during the second World War by military pilots (Chester, 2007). They usually seemed to consist of single balls of plasma closely resembling lightning balls. Similar small, single, plasma balls are occasionally reported now by passengers in commercial aircraft. They are normally seen fairly close to the wing tips of the aircraft. It may be significant that the small "foo fighter" plasmas seem to have been reported more commonly in war ravaged areas than in most places in peacetime. The air

could have been very polluted in war zones and dusty air is thought to lead to the production of smaller plasma balls than does clean air (Turner, 2002).

RATE PROCESSES IN PHYSICS AND CHEMISTRY

If we are to seek a rational explanation for all of the well-established characteristics of UFOs, it is necessary to accept several of the points made in recent publications concerning naturally contained air plasmas (Turner, 2023, 2024). The first of these papers discusses some of the reasons why vapor phase electrochemistry has never been developed to a state where real gas phase mixtures containing ions can be treated quantitatively. The second paper contains an explanation for the structural aspects of UFOs as fairly large assemblies of smaller natural plasmas that resemble lightning balls. Due partly to the various limitations mentioned earlier, even less can be predicted concerning the well-established characteristics of UFOs than can be predicted for those of their component plasma balls. It seems that, even for lightning balls, only the range of sizes can be predicted (Turner, 2002).

The theoretical problems referred to earlier impose serious limitations on what is predictable of the properties of both ball lightning and UFOs. The limitations can be thought of as stemming from unavoidable differences in the way electrically charged systems are studied by particle physicists and by chemists. The exceptional power of physics comes from using centuries of work by (frequently amateur) mathematicians (Penrose, 2004).

Similar approaches in chemistry cannot be used because it is almost impossible to predict the energy levels for any molecule, ion or radical that is heavier than hydrogen. As a consequence of this fact, all the properties that control the interactions between chemical species need to be measured separately for each chemical species (atom, molecule, ion or radical) that is involved in any specific chemical reaction. There are 92 naturally occurring elements and the simply immense number of compounds they can form means that, in general, neither thermodynamic changes nor relevant rate processes can be usefully predicted.

We know very little about why exactly air plasmas are so rare. This is probably the main reason that no-one has ever succeeded in preparing a real, long lived, lightning ball - except by accident (Turner, 2024). Likely reasons for all our total failure to prepare artificial ball lightning intentionally are the following: (1) the local concentrations of contaminants in the air are not ideal, (2) the local electrical state is not appropriate, (3) the local air possesses a non-optimal temperature and/or temperature gradient and (4), most of the reactions that favor plasma formation would need to possess optimum rates (none of which we know).

It seems inevitable that optimizing all of these variables can only be achieved on the basis of many new experiments guided, as far as possible, by what we already know. A research program large enough to address all these needs is very unlikely to be supported in the present political climate (Turner, 2023). A combination of collecting unexplained observations already available, new observations of the phenomena and new experiments appears to be the only feasible approach. An example of what can be learned from this kind of study is the decades long program of observations of earth-lights that have been carried out in Norway in the Hessdalen valley (Teodorani, 2004).

Before attempting to draw new conclusions concerning long thin air plasmas, it seems appropriate to refer to an observation that was reported half a century ago in the Monthly Weather Review (Price & Carlstead, 1966). The authors were professional meteorologists at the U.S. Weather Bureau in Honolulu. They began their account with the following sentence: "Nature follows her own schedule, not ours; and her phenomena are to be seen only by chance, not by appointment."

The authors then go on to describe an extraordinary, almost unbelievable, experience of an elderly lady whose common sense, and accuracy of memory they were able to confirm for themselves shortly after the event. The observations (of horizontal lightning) were made while the lady was on a covered patio that overlooked her garden and whose area of view, in every direction, was strictly limited and precisely defined. Her question of the meteorologists was "... what made it die and in my garden?"

The basic facts are, that at the time of the occurrence, she was on the patio out-doors and happened to be looking towards a birdbath in her garden. This was situated 3.8 m from her viewing position as a lightning stroke passed very slowly in front of her between her position and that of the bird table. It hid the pedestal but not the actual birdbath on top and then suddenly extinguished itself without ever visibly changing its height above the ground. She stated that it appeared to be a brightly shining solid object that was "dazzling electric blue" and that it was traveling about 15 cm above the grass at a sufficiently slow speed for it to be in view for 3 or 4 seconds. The phenomenon observed has to be what is known as "rocket" or "slow" "lightning". These discharges travel far more slowly than do normal lightning bolts but much faster than the majority of lightning balls (Uman, 1969).

AIR BREAKDOWN AND LONG THIN AIR PLASMAS

Townsend (1915) was the first physicist to provide a mathematical description of electrical breakdown in the air. Much later, Loeb and Meek (1941) showed that real electrical breakdown is far more complicated than Townsend had assumed. Later still, Loeb (1965) stressed the importance of what he called "ionizing waves of potential gradient". These waves can form by charge neutralization at the tips of lightning stepped leaders.

As we have seen, the early studies of Thomson (1893), that were followed up by others, contributed to Loeb's concept of a pilot leader. As we have also seen, this concept was later dismissed by Uman (1969) as being of little value in understanding lightning. His conclusion, that such concepts as a pilot leader are of no help in developing quantitative models of lightning formation has proved correct, but this does not mean that the concept of a pilot leader is unlikely to be helpful in understanding long-distance interactions involving air plasmas.

A personal experience in 2017 seems relevant here. It occurred while my wife and I were traveling east on a particularly straight part of Interstate 90, between Gillette and Moorcroft, Wyoming, on the 24th of August. For half an hour or so on smaller roads in very stormy weather, we had watched an extremely dark sky ahead of us but eventually the whole sky was pitch black. From it extremely long and unusually straight and vertical lightning strokes to Earth were being generated.

They were obviously coming from a very limited number of locations. Shortly after we arrived at a long straight portion of the road, my wife pointed out that all the strokes were clearly coming from two well defined locations, one to our left and the other to our right. No other sources of lightning were visible and nor was any horizontal lightning. As we watched, it became increasingly obvious that the two lightning sources were never discharging at the same time, or even independently. Discharges were alternating between the source to our left and that to our right.

Depending on how bright the initial lightning discharges were, one, two or occasionally three discharges to our left were invariably followed by one, two or three discharges to our right, after which the process was repeated many times. During the whole time we were traveling on the straight road no discharges were seen from any other direction. It was as if electric charge was being selectively delivered to Earth from one of the positions and then similar quantities of charge would be delivered from the other position. Subsequent enquiries from the National Weather Service in Rapid City, South Dakota, confirmed that an isolated pair of lightning discharging areas had been recorded and that their positions were consistent with our observations. The separation of these two positions, over the duration of the storm, covered a range of about 1.6 to 2.1 km. Matt Bunkers from this weather station kindly provided these details.

Clearly, it is not easy for anyone to believe that a pair of well separated clouds can behave like this. Nor is it easy to accept that a large compact group of plasma balls is capable of being attracted to a helicopter as it was in the case described by Zeidman (1999). Numerous accounts of aircraft tracking by UFOs, as in this case, are equally difficult to believe (unless aliens are involved). When such apparent anomalies are reported, it is hardly surprising that some individuals, who have not themselves experienced such events, should be so happy to bury the evidence. This appears to have been the policy of the US Air Force for many decades (Hynek, 1972, 2020). But the evidence does exist in plenty and, once this has been accepted, some sort of natural explanation should surely be sought.

Evidence on these matters is particularly likely to be taken seriously by someone who has previously been forced to learn that valid quantitative theories for ion interactions in moist gases are lacking (Turner, 2023). Although the structures and visible characteristics of UFOs now have a perfectly rational explanation (Turner, 2024), the way a small group of UFOs track aircraft requires one, and only one, new assumption of any importance. Attention will now concentrate on this matter.

UFOs and lightning balls are both rare phenomena and it seems likely that, when both phenomena occur, the local impurity content of the air and its local electrical environment determine whether or not they are formed (Turner, 2024). We shall assume that, whatever these conditions may be, they need to be satisfied before any long, invisible (and probably thin) cylindrical air plasmas can form.

Long ago, Thomson (1893) discovered that feeble pulses of light can be produced inside 15 m long, evacuated glass tubes fitted with electrodes at each end. Much later, these and several subsequent follow up experiments were discussed by Loeb (1965). Very thorough evacuation of the tubes was apparently needed if reproducible results were to be obtained. The only requirement for the pulses to form was that one of the electrodes be energized by an electric pulse of sufficient magnitude. Under these conditions, the pulses would travel at about a third of the speed of light and they could be produced at will.

Loeb attributed these pulses of light to what he called ionizing waves of potential gradient. He raised the possibility that phenomena like this might always play a part in the very earliest stages of electrical breakdown in the air. However, his attempts to quantify what Thomson and others had found were, as noted earlier, soon found to be of little value in practical lightning research. Nevertheless, all the experiments discussed by Loeb, and his interpretation of them, still seem important. One obvious reason for ignoring the findings in real air is the very low pressures needed to obtain reproducible results.

At the very low gas pressures studied, any *sample of air* would essentially contain only nitrogen, oxygen and water vapor. As noted earlier, it seems that many impurities in the air can either promote or inhibit the essential processes that occur at an air plasma interface. Any sample of real air (at or near atmospheric pressure) will contain numerous gases in addition to nitrogen and oxygen. Water would have been unavoidably present in all the evacuated tube experiments because thorough baking of the glass tubes is very unlikely to have been attempted.

The long lengths of the tube that were used would have been almost impossible to bake and there is no reason to think that such a process was thought necessary. Multiple layers of water are always present on any glass surface that has not been thoroughly baked, so that the evacuated glass tubes used would be expected to have contained nothing detectable except for traces of nitrogen, oxygen and water vapor.

It seems worth considering the possibility that, in the complete absence of undesirable impurities (as in this case), feeble pulses of electromagnetic radiation could be observable even at atmospheric pressure if there were no impurities present. In what follows it will be assumed that, in real air on very rare occasions, undesirable and beneficial air contaminants can effectively cancel each other's influence so that pulses of electromagnetic radiation can pass along some cylindrical volume of air at atmospheric pressure. In other words, under these rare conditions, plasmas will occasionally form in the air, as some kind of temporary analogue of a coaxial cable.

These hypothetical objects will be referred to in what follows as "plasma cables". Short versions of them may well be crucial in the very earliest stages of lightning formation in which case they can possibly be considered to be precursors of what Schonland (1932) called α stepped leaders. Although these "cables" are no more than analogues of real cables they will still be referred to here as cables. Since they can only carry very small currents, they are unlikely to be visible in any thunderstorm.

The bright return strokes observed during thunderstorms are believed to be near perfect cylinders but the invisible "pre-leader" objects to be considered shortly might well be far less perfect than this. Local differences in air contamination would certainly be expected to cause departures from perfect cylindrical symmetry if not preventing the plasma cables from ever forming in the first place. If any did form briefly, so much irreversible damage would normally be done to the cable, shortly after its formation, that any incipient plasma cable would cease to exist.

Air breakdown has long been known to be produced in several stages (Schonland, 1932), the earliest stages being by far the least well understood. This is hardly surprising since the resulting electrical currents will be so small that they would be undetectable in the presence of the far more powerful radiation being produced in an active thunderstorm. Clearly, under the conditions discussed by Loeb, impurities that might influence chemical processes were all absent. We shall assume that, in appropriately contaminated moist air, Loeb's "ionizing waves of potential gradient" might still be transmitted, even at atmospheric pressure, over considerable distances. Of course, this would only be possible if all the air contaminants, over the whole length of the cable, happened to be present at relative concentrations that are near ideal.

The possibility clearly exists that rare combinations of contaminants in the air at atmospheric pressure, when combined with appropriate electrical conditions, would always cause favorable electrochemical processes to be established. However, an obvious difficulty in testing this possibility is that igniting the plasmas might require some other phenomenon, such as a population inversion to be present (Handel & Leitner, 1994; Turner, 2023). These phenomena might also be requirements for a long life - as could be optimal potentials and potential gradients.

The only certain requirement seems to be that optimal blends of chemicals are required for an air plasma to have a long life at atmospheric pressures. For all these reasons, it seems very unlikely that the models discussed so far could, on any realistic timescale, be subjected to the kind of falsification tests that Popper (1959) and many later scientists have argued are needed before they could be considered any real part of science. Qualitative arguments, however, could still provide instructive clues for use in future studies.

Electrical conduction in a gas is quite unlike that in an aqueous solution. In a liquid, anions and cations move at

comparable speeds in the same region of the liquid. They yield transport numbers (the fraction of a current carried by ions of either charge) that usually lie between 0.3 and 0.7. The situation in a tube of moist slightly conducting air could hardly be more different. The electrons will flow in the center, held together by self-induced magnetic forces known as Bennet pinching (see e.g. Alfvén, 1981) while cations can only conduct current very slowly near the cylindrical surface of a plasma cable.

In any conducting cylinder of gas, some charge neutralization will presumably occur close to the electron path and this will heat the center of the cylinder where virtually all of the current is flowing. There need not be much electron scattering because of Bennet pinching. Thus, even a weak electron current could be strongly confined to the center of this hypothesized cable.

It might be possible to check these ideas by modeling - but only if no attempt were to be made explicitly to include chemical reaction rates. There is no chance that such rates could be employed validly (Turner, 2023). In practice, because of ion hydration on the outer surface of the conducting column the fraction of the current carried by cations will be negligible. This is almost the only certain fact. An obvious doubt is whether sufficient information is currently available to learn much more.

We now consider one of these hypothetical cylindrical tubes of slightly conducting air that connects two distant UFOs - or one UFO and an aircraft. It is assumed that the same processes are responsible for the apparent communication between the two sites of lightning initiation that were observed in Wyoming and was described at the beginning of this section. If a current can flow inside a cylinder that provides such communication, it is likely that alternating currents at a wide range of frequency could be present inside the plasma cable.

Clearly the processes being described are very complicated and, partly because of the basic science that is missing (Turner, 2023) there is little hope of reliably quantifying the relevant chemical arguments. However, the explanation for communication between a UFO and an airplane is considerably more plausible than is piloting of the UFO or UFOs by aliens. An important point is that (as with lightning balls) mechanical stability can be achieved only when the processes stabilizing the surface of the plasma have been optimized. This fact can easily explain why both spheroidal collections of air plasmas (such as UFOs) and any invisible connections between them are such rare phenomena.

A comparison of the required conditions for igniting air plasmas of different shapes can usefully be made here. Among thousands of observations of lightning balls, there are remarkably few where multiple balls are formed. The situation with UFOs is very different. Here it is quite common for multiple UFOs, at fixed distances apart, to be observed tracking an airplane. One of the few cases where multiple lightning balls have been reported occurred in 1876. In this case, the observation was of "numerous globes of light, the size of billiard balls, which were moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding their grasps" (Corliss, 1977, pp 35-36).

The latter observation simply confirms the electrochemical model for ball lightning which predicts that ball lightning is positively charged on the outside - with a negatively charged plasma inside it (Turner, 1994). Were it not for air inflow to each plasma ball inside a UFO, UFOs would not exist - because of electrostatic repulsion. From the very different ways in which the two types of air plasma behave it would seem that multiple UFOs are probably all (or nearly all) formed during cosmic ray showers. For this to be the case, the time required for plasma ignition must, therefore, be shorter than that required for cation hydration and stabilization.

COMMUNICATION THROUGH APPROXIMATELY CYLINDRICAL AIR PLASMAS

Once it is accepted that these rare structures are probably real, it is worth giving them a little further consideration. Having once established an electrical connection between two remote plasmas, a direct current or an alternating current can pass between them down the center of the cable. If this occurs, a long narrow plasma that acts like a high frequency transmitting co-axial cable would have been set up because the air plasma chemistry on the plasma surface is expected to be exactly the same in a cylindrical plasma as in a spherical one.

The electrons would move very fast near the center of the core with the outer conductor consisting of a chemically active and permeable sheath. The different forces involved presumably can, occasionally, ensure a fairly straight path between the interacting objects using some of the same forces as those that stabilize a lightning ball. Obviously, any sufficiently large chemical or electrical interferences with the outer conductor could easily destroy such a plasma cable.

In a thunderstorm, after a number of well described preliminary steps (e.g. Uman, 1969), a bright lightning stroke can be seen. If such a bolt finally strikes the ground, the

plasma will have become far hotter than the first visible leader stokes: the so-called α stepped leaders (Schonland, 1932). Final strokes usually have diameters of a few cm (Uman, 1969). Presumably, very bright horizontal lightning bolts have similar diameters, but the earliest pilot leader strokes will surely have been very much thinner.

Now to consider these thin, invisible, columns of slightly conducting air. Sometimes and somehow, in several fairly well characterized steps, electrons cause extensive electrical breakdown and force their way through the air. The motion will be driven by a potential gradient that can vary rapidly (or hardly at all) in unspecifiable places along the cable and at different times.

Interest here is with the kind of long thin conducting plasma that is invisible and which can sometimes become an α stepped leader. It will be assumed that a current can flow inside these invisible cylinders and that the initially needed current has resulted partly from Loeb's ionizing waves of potential gradient (Loeb, 1965) and partly from Townsend multiplication. Shortly after this, a long narrow plasma would have been set up that acts as if it were a high frequency transmitting co-axial cable with electrons moving very fast in the core and cations becoming hydrated and moving very slowly on the outside. It is necessary to assume that the different electrochemical forces involved on the outside of the cable can occasionally ensure a fairly straight path between two interacting objects.

Obviously, air (with its contaminants) is free to enter the outer "surface" of this, not always straight, plasma cable. This fact could certainly ensure very short lives for most incipient cables but a few would probably have favorable electrochemical processes occurring over their entire length. Long straight, perfectly cylindrical, plasmas are probably rarely present in real air but the idealized system could represent a reasonable approximation to reality - except for the obvious fact that impurities might cause kinks in the cable or end its life. These complications will be ignored.

The central region of a plasma cable will clearly be the hottest part and refrigeration is absolutely necessary on its outer surface - if the plasma cable is to be really stable. Clearly any air contaminant that destroys the refrigeration processes on the plasma surface could easily lead to a collapse of the plasma surface (Turner, 2024). There seems no reason why processes that are chemically exactly like those in a lightning ball, should not be needed to stabilize the outer surface of the cable.

For no part of the proposed mechanisms can reliable quantitative input data be even guessed so that obviously no detailed suggestion could be either proved or disproved. However, once it is admitted that there might be natural equivalents of coaxial cables, electrostatic interactions over long distances are qualitatively understandable and forces between the objects might be explicable. If this is the case, there would obviously be no need to invoke alien pilots or groups of alien pilots to explain any UFO tracking observation. The above qualitative arguments at least seem reasonable.

Apart from our longstanding ignorance in the field of vapor phase electrochemistry, there is another matter that is usually ignored. It relates to the fact that, in all electrical studies on Earth, the generally agreed state of zero potential is that of the Earth's surface, the Earth being approximated as a perfect conductor of electricity. It had been early realized by Kelvin (Thomson, 1860) that, since we know nothing about the electric charge distribution in the Universe, this zero state of potential is simply a matter of convenience and no true zero of potential can be known. However, this restriction would not apply if there were to be some way by which perfect charge neutrality could be ensured and identified.

The huge number of molecules involved in any measurable property of a gas normally ensures that an exact equality of charge is neither measurable nor achievable. Guggenheim (1967) used this argument concerning electrolyte solutions in liquids. However, the processes being maintained in an invisible plasma cable in the air might well require a very precise balancing of charge either inside or very near the plasma cable. If so, its height above the Earth could be a crucial constraint on its stability.

The electrochemical processes that stabilize the surface of any air plasma might well require an absolute balancing of charge somewhere within or very close to the cable. It seems quite possible that this requirement, for local charge balancing, is why nearly all reported interactions between UFOs and aircraft are so close to horizontal. The reported heights of UFO tracking can vary from about 18 km down to 20 m (Haines, 1994) but UFO tracking is hardly ever (if ever) seen to deviate far from horizontal.

Differing (horizontal) heights observed in UFO tracking seems reasonable when the large-scale electric currents flowing in the atmosphere are considered. The fact that UFO tracking of aircraft does not seem to be observed during thunderstorms confirms these arguments since current flow in the air is only strongly concentrated near thunderstorms, the current flow from the Earth being concentrated above these storms while that flowing in the

opposite direction passes through vastly larger volumes of fair weather air. UFO tracking always seems to be reported in fair weather.

In a normal aqueous phase solution, the (arbitrary) standard by which redox potentials are compared is zero for the reduction of a proton to hydrogen gas. It is only at 25^0 C that many redox potentials are known. According to the compilation of Lide (2003), they range between - 3.09 and + 2.65V for all known redox reactions between nitrogen, oxygen and water. In the absence of any evidence to the contrary, we can only assume that the spread of redox potentials in the gas phase (if it could be measured) would not be orders of magnitude larger than it is in water.

The electrical potential of the ionosphere with respect to that of the Earth varies between 150 and 600 kV and the average height of the ionosphere is about 300 km. (Krider & Roble, 1986). These values are model dependent, though they are generally considered reasonable. A few measurements of atmospheric potentials, based on electric field measurements in and just above thunderstorms, are also available (Marshall & Stolzenburg, 2001). For heights well above cloud level the voltage range is -24 to +70MV. These studies were made near to 9 storms. The measurements were made up to about 9 km height. In comparison with these potentials, a spread of 6V or so is minuscule and the range of UFO tracking heights therefore seems reasonable.

In other words, chemistry does not significantly influence the heights at which UFOs track aircraft and it is reasonable to assume that the height representing an absolute potential of zero is close to that at which both UFO communication and horizontal lightning are observed. As we have seen, UFO tracking has been observed at heights between 20 m and 18 km (Haines, 1994). The wide range of potentials in the air seems consistent with the implied claim, made earlier, that this tracking can only occur at a height where the absolute atmospheric electrical potential is very close to zero, at which potential the concentrations of positive and negative charges are exactly equal.

These arguments obviously apply only to long cylindrical plasmas, not to spheroidal ones. While UFO tracking always seems to be near horizontal, individual lightning balls can be stable all the way between cloud height and ground level. It is possible that these differences might, in future, make it possible to learn more about all air plasmas: at present it only confirms that the local electrical state of the atmosphere is one of the parameters that allow naturally contained air plasmas to form and survive.

FORCES INVOLVING PAIRS OF REMOTE UFOS

The chemical and electrochemical processes that occur on the outer surfaces of conducting plasma cables and stabilize their structures are believed to be identical to those that stabilize the surfaces of lightning balls. (Turner, 2024). Reports of aircraft tracking by UFOs (Haines, 1994; Turner, 2024) show that these phenomena usually last far longer than do most lightning balls. This implies that the Bennet pinching, which is only possible in a cylindrical air plasma, assists greatly in the purely electrochemical effects that occur on the surfaces of all air plasmas. Bennet pinching is known to be extremely important in the interstellar medium (e.g. Alfvén, 1981) and it seems to be similarly important in cylindrical air plasmas on Earth.

In a group of UFOs tracking an aircraft, the UFO-UFO connections are not always horizontal. However, the absolute space charge is unlikely to be far from zero in fair weather over the observed distances between UFOs that are tracking an aircraft. The fact that tight groups of interacting plasma balls seem to lose one member of the group very rarely, if at all (Haines, 1994), is probably because groups of UFOs emit large quantities of UV, which then support the overall stability of the assembly.

When considering plasma cables, we are concerned only with processes that resemble the undetectable ones that precede the first stepped leader stroke of a lightning discharge. These would be the α stepped leaders of Schonland (1932). Although the range of heights over which UFO *tracking* occurs can now be understood, the forces between the communicating objects remain to be explained. For simplicity, we will consider only the case of two well separated, but identical, interacting plasma balls (one from each UFO). In this case the two ends the cable will be electrochemically identical unless there is some change in the energy content (brightness) of one of the interacting balls. The forces between two objects when an aircraft is at one end of the cable may not differ greatly from those between two interacting UFOs.

An invisible air cable obviously differs greatly from a real co-axial cable. To the absence of metallic conductors must be added the fact that the outer surface of the cables is electrochemically active and so potentially unstable. The conductances of both the inner and outer conductors in the air will clearly be far lower than in a real coaxial cable. A circuit equivalent to this plasma cable could be defined in principle. Presumably, it would somewhat resemble that of a coaxial cable terminated by a resistor that is much higher

than the value defined by its effective dimensions. In other words, the real impedance of the invisible plasma cable would differ greatly from one terminated by its characteristic impedance. For this reason, if a pulse of current passes down the cable, there would be repeated pulses up and down it (from reflections at the ends) just as in the case of a real coaxial cable (see e.g. Schelkunoff, 1963).

A cable between two remote UFOs will presumably be connected through a single plasma ball at each end of the cable. We know from the findings at Hessdalen (Teodorani, 2004), that the plasmas making up an earth-light can be subject to considerable changes in energy (i.e. brightness). The studies also imply that the occasional inflow of contaminants, such as pollen grains or the occasional insect, or a sudden input of electromagnetic energy, can cause such changes. In an interacting pair of remote UFOs, a sudden change in the power of one of the UFOs would start a pulse of current between the two UFOs - thus establishing communication between them.

Obviously, communication between two UFOs cannot, alone, explain how they produce a force that holds them at fixed relative positions. We consider two UFOs at some unspecified but considerable distance apart with a series of current pulses flowing up and down the plasma cable between them. When the electrons flow into one of the balls, a reduction in charge on the outer surface of the plasma ball will result. A signal will then return down the cable and a similar neutralization of the surface of the plasma ball at that end of the cable will occur. These pulses will then proceed up and down the plasma cable because there is such a large mismatch between the actual and characteristic impedances of the plasma cable.

The effective masses of the central "wire" of the cable and of its "surface" will be very different because of the huge difference in the masses of electrons and hydrated ions. If mechanical forces along the length of the cable are to result from pulses of electricity they will, as a consequence of Newton's third law, only be important for the plasma cable's sheath, since electrons are far lighter than hydrated ions. Relative movements between two UFOs or a UFO and an aircraft could arise as a consequence of chemical changes somewhere along the length of the cable.

Haines' approach to UFO study (Haines, 1994) was to provide brief summaries of hundreds of convincing UFO reports. On the basis of the reports available to him, it seems that, when a group of UFOs track an aircraft, the individual UFOs usually seem to remain at fixed relative positions. UFOs sometimes do slowly approach an aircraft although they never seem actually to collide with it. It seems that, at close range, the forces of electrostatic repulsion prevent collisions between UFOs and aircraft.

CONCLUSIONS

Air inflows control the structures of UFOs in exactly the same way they do with lightning balls. The presence of cylindrical air plasmas between a UFO and an aircraft or between neighboring UFOs can be explained similarly. However, additional forces (Bennet pinching) will also be present in a linear plasma and this phenomenon can provide additional stabilization to a cylindrical plasma. These facts are only likely to be accepted once it is understood that electrochemical forces stabilize all air plasmas and that no valid theories for ion-ion interactions in real air are currently available.

It now seems clear that our ignorance concerning cylindrical air plasmas is at least as great as it is for spherical plasmas. In both cases the only real anomalies are that less is understood about them than with most other natural phenomena. Precisely the same ignorance seems to apply to the invisible phenomena that precede all visible lightning leaders: the pilot or α stepped leaders. We currently have no idea why the earliest stepped leaders are limited to lengths of about 50 m while interactions involving UFOs are sometimes reported for distances of several km. Neither can we predict the closest possible distance between an aircraft and a UFO. One obvious requirement for a stable plasma cable is that electrons in long cylindrical plasmas are not significantly accelerated at right angles to the axis of plasma. It might be instructive to investigate the possibility that crude models based on the earlier suggestions here could predict the length of early stepped leaders or at least the relative lengths of lightning leader strokes and typical aircraft tracking distances.

All the reliably reported characteristics of air plasmas can be explained once two facts are accepted. The first is that all these phenomena (including those where the lights are completely obscured by thick mist) are held together by electrochemical forces identical to those that hold lightning balls together. As with gas flames, it is the inflow of air, driven by chemical reactions, that holds an air plasma together. The second important fact is that no valid theory for the interactions between ions in a moist gas exists. Clearly, most of the arguments presented here lack quantitative support. However, they do provide a far more reasonable explanation for the UFO tracking of aircraft than

their tracking by alien pilots in craft that possess seemingly impossible flight characteristics.

A possibility, not discussed here, is that, since the storms which produce tornadoes probably always contain spheroidal air plasmas, cylindrical connections between these plasmas might possibly play a part in explaining the formation of hurricanes from individual tropical storms over the ocean.

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CONFLICTS OF INTEREST

There are no conflicts of interest to disclose.

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BRIEF REPORT

Evaluating the Effects of Pure Tone Solfeggio Frequencies on Skin Conductivity

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ABSTRACT

This study investigates the impact of Solfeggio frequencies on skin conductivity, a measure linked to autonomic nervous system arousal. Through controlled exposure, participants were assessed for changes in skin conductivity in response to six specific frequencies, including 528 Hz, which are hypothesized to promote healing and overall well-being. Findings indicate that 741 Hz and 852 Hz increase skin conductivity, potentially validating their use in therapeutic applications.

KEYWORDS

Biophysics, skin conductivity, holistic wellness, solfeggio frequencies, sound healing, integrative research.

INTRODUCTION

Solfeggio frequencies are specific sound frequencies believed to promote healing and balance in the body. The six primary frequencies—396 Hz, 417 Hz, 528 Hz, 639 Hz, 741 Hz, and 852 Hz—are thought to resonate with the body's natural rhythms, influencing emotional and physical well-being. 528 Hz has been shown to reduce stress, but scientific evidence on the other five frequencies is scarce (Akimoto et al., 2018). The skin, as a sensory interface, responds to physiological and emotional stimuli through changes in conductivity, making it a valuable marker of autonomic nervous system activity. Based on Ohm's Law, changes in conductivity can be measured by the galvanic skin response (GSR), by maintaining a constant voltage with the individual in a series circuit. Controlled by the autonomic nervous system, the GSR is considered useful to indicate emotional arousal and stress (Lykken & Venables, 1971). This study investigates how Solfeggio frequencies impact skin conductivity, offering insight into their potential therapeutic applications.

MATERIALS & METHODS

Participants and Survey Completion

The study included 18 healthy participants (9 females, 9 males) aged 17–75, with a demographic breakdown of 12 Black and 6 White participants. Prior to measurements, each participant completed a demographic survey including age, race, and gender. Participants were also asked about their current mood, substance use, and familiarity with Solfeggio frequencies via multiple-choice questions. A post-treatment survey was also

provided, where each participant "self-reported" their mood utilizing multiple-choice options. Specifically with emotion, individuals were asked to report how they were feeling before exposure to the Solfeggio frequencies, as well as after they were exposed; both surveys included an open-ended option labeled as "other" if the emotion was not listed, so that each person could report their mood. All consent procedures adhered to ethical guidelines established by the university's research review board. Informed consent was obtained by each participant.

Galvanic Skin Response and Solfeggio Frequencies

A "Solfeggio Frequencies Pure Tone" playlist by Emiliano Bruguera was developed that included six frequencies (396 Hz, 417 Hz, 528 Hz, 639 Hz, 741 Hz, and 852 Hz), as well as a combination of all six frequencies. Pure tone frequencies were utilized with the intent to maintain a constant frequency that has a singular pitch. Each participant was placed in an enclosed, 4 × 4 room by themselves (with the researcher), and asked to listen to each of the selected frequencies for five minutes. Everyone was requested to remain quiet, motionless, and in a seated position throughout sound exposure while avoiding crossing the knees or ankles. Each pure tone solfeggio frequency was projected for five minutes through a wireless speaker that was placed 6 inches away from the participant, and additional external sound was avoided. Sound intensity was controlled and monitored with a sound level meter. The sound level meter was positioned by the ear of each participant to obtain the loudness of each frequency being played. For each frequency exposure, the sound level was maintained within a range of 75 to 79 decibels (dB); the sound level was 62 to 64 dB during the pre- (control), post-frequency, and washout intervals, which provide an indication of the sound within the room when no frequency was being played. Conductivity was measured during each frequency exposure, as well as pre- and post-frequency exposure. Prior to electrode application, participants were asked to wash and dry their hands thoroughly. A Qubit (Q-S222) GSR sensor was connected to a Vernier LabQuest interface, where two electrodes were placed on the fingertip of the pointer and middle fingers of the left hand for each participant, providing real-time measurements of changes in the skin's ability to conduct electricity in micro-Siemens (μS). Participants were exposed to each frequency and a combination of the six frequencies in ascending order, for five minutes each with a 30-second washout interval in between each measurement. Baseline skin conductance readings were collected prior to frequency exposure (control), followed by a post-exposure washout period (no sound being played). Participants were given a silent acclimation period at the beginning of the measurement session to allow for physiological stabilization, ensuring the refrainment of any influence on the baseline data from the novelty of the experimental setting. In addition, measurements were taken prior to all frequency exposure, post-exposure to all frequencies, and a combination of the six frequencies was obtained.

DATA ANALYSIS

Repeated measures analysis of variance (ANOVA) was used to analyze the data to assess the different experimental conditions. Changes amongst the various groups were compared against the control (pre-exposure) condition. Statistical significance was determined based on a $p < 0.05$.

RESULTS

The GSR measurements were collected in real-time and represented as an average of all participants after five minutes of frequency exposure. Compared to the control, there was a slight, insignificant decrease in the GSR after five minutes of exposure to 396 Hz (2.96 ± 0.41 μS vs. 2.63 ± 0.05 μS), followed by a linear increase in GSR with augmenting the frequency exposure. While there was some variability in GSR across participants, data analysis using repeated-measures ANOVA revealed statistically significant increases in skin conductivity for 741 Hz, 852 Hz, combined frequencies, and post measurements compared to control baselines ($p < 0.05$), with no significant effects for the remaining frequencies (Figure 1). Interestingly, there was one participant that exhibited minimum change in GSR across the different frequency exposures. Eighty percent of the participants were unfamiliar with Solfeggio frequencies (data not shown). As shown in Table 1, the survey data revealed that 12 of the 18 participants experienced a neutral emotion before the study; 11 participants expressed this emotion after the study. Joy was the second highest emotion reported (6 participants: pre; 2 participants: post). Post measurements, five individuals expressed feeling annoyed, tired, and less calm (Table 1). These findings suggest a potential interaction between specific frequencies and autonomic arousal, implying that an increase in autonomic arousal correlates with an enhanced GSR.

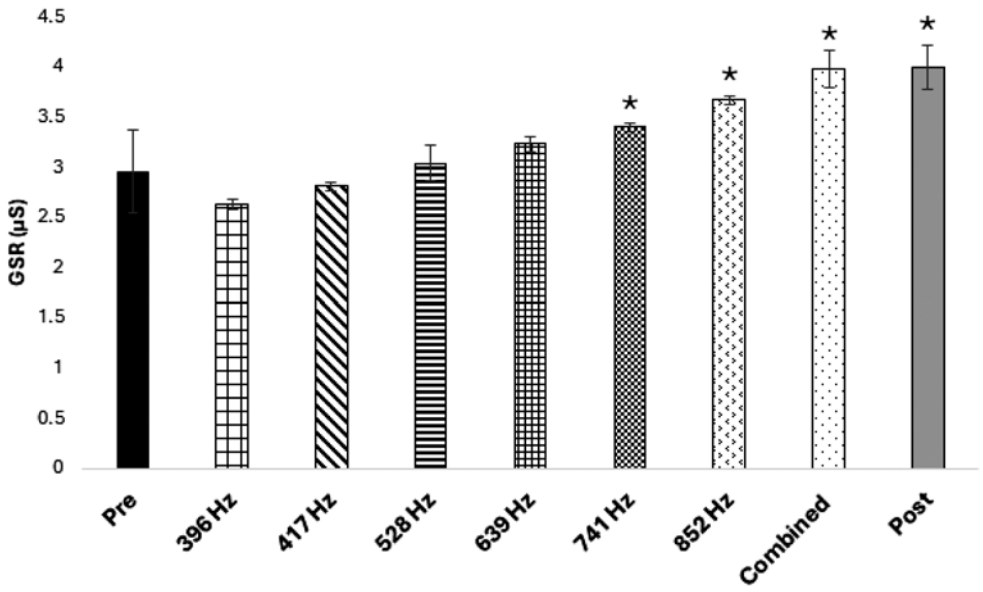

Figure 1. Overall Galvanic Skin Response (GSR) for All Participants. Participants were exposed to six individual frequencies, as well as the combination of all frequencies as GSR was measured. Data is represented as mean ± SD, n = 18 (* $p < 0.05$).

Table 1. Overview of Emotional Response to Solfeggio Frequencies.

Emotion	Number of Participants (PRE)	Number of Participants (POST)
Neutral/Content	12	11
Joy	6	2
Annoyed/Tried/Less Calm	0	5

DISCUSSION

The skin is the largest and most sensory-rich organ, serving as the interface between the body and the external environment (Chen & Lyga, 2014). The findings of this study highlight its critical role in detecting and responding to external stimuli, such as pure tone sound frequencies. Skin conductivity changes, mediated by the activity of eccrine sweat glands, provide insight into the autonomic nervous system's response to specific Solfeggio frequencies. These findings align with prior research suggesting auditory stimuli's impact on autonomic responses (Kumar et al., 2022). Known as the "miracle tone", 528 Hz is the one frequency that has been most scientifically studied and is suggested to attribute to emotional healing, DNA repair and lower stress (Akimoto et al., 2018). In this study, the self-reported survey data indicated that many participants were content before and after frequency exposure, yet there were several individuals who felt annoyed following the experiment. Frequencies like 741 Hz and 852 Hz demonstrated measurable effects on conductivity, suggesting that auditory inputs can modulate physiological states, arousal or relaxation response. This supports prior research on the skin as a responsive medium for understanding emotional and physical well-being (Gatti et al., 2018; Nagai et al., 2019). There was one exception where a participant demonstrated no significant changes in their skin conductivity in all conditions, which is surprising as GSR changes are expected in the presence of external stimuli. When acknowledging the impact of sound on the body, it is important to consider the concept of resonance—*the occurrence of a vibrating object causing another object to vibrate at a higher amplitude*. For resonance to occur, the source of sound must emit a frequency that would be a natural sound to the other object. The standing human body naturally vibrates between 9–16 Hz, depending on posture, and may cause a substantial augmentation of vibrations when exposed to an external stimulus (Randall et al., 1997). These insights emphasize the potential of using the skin as a biomarker in therapeutic interventions aimed at stress and relaxation management.

IMPLICATIONS AND APPLICATIONS

To our knowledge, the current study is the first of its kind to address the effect of pure tone solfeggio frequencies on the galvanic skin response. It was important to

use pure tone frequencies as they are simpler and easier to analyze compared to multiple frequencies that tend to have more complex waveforms. Participants were not screened for any underlying conditions that could potentially influence the data outcomes. While there is a small sample size involved, this study does address the limitation of data collection on underrepresented populations. We recognize that the results reveal an increased skin conductivity with higher frequencies, suggesting greater autonomic arousal. Because the GSR provides an indication to the electrical activity in the body and solfeggio frequencies promote balance, the findings in this study suggest that certain frequencies may have more benefits to overall health than others. For example, 741 Hz is believed to promote cleansing and detoxification, which may attribute to more arousal and irritability as the body attempts to re-establish balance; however, the exact cause for the observed effects remains unclear. This uncertainty lays the foundation to explore other issues and contributing factors of this variability such as underlying conditions, age, gender, non-Solfeggio frequencies, etc. Next steps include randomizing frequencies to account for sequential increases versus exposure.

CONCLUSIONS

This study investigates the impact of Solfeggio frequencies on skin conductivity, a measure linked to autonomic nervous system arousal. Findings highlight the potential of specific frequencies, particularly 741 Hz, 852 Hz, and the combination of all six measured frequencies in modulating skin conductivity. Further research involving larger and more diverse populations is needed to better understand the therapeutic applications of these frequencies, especially in the context of stress reduction and relaxation-based interventions.

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AUTHOR CONTRIBUTIONS

Tennille D. Presley: conceptualization (lead); data curation (lead); formal analysis (lead); funding acquisition (lead); investigation (equal); methodology (lead); project administration (lead); resources (lead); writing—original draft (equal). Marcus K. Stamps: data curation (supporting); investigation (equal); methodology (supporting). Jennifer A. Davis Alexander: investigation (equal); methodology (supporting); project administration (supporting); writing—original draft (equal).

AUTHOR DISCLOSURE STATEMENT

The authors have no conflicts to disclose or competing interests to declare.

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ESSAY

Towards a Natural History of Psi: An Evolutionary Proposal Based on Consilience of Inductions

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ABSTRACT

For almost a century since its establishment as a scientific discipline, the field of Parapsychology has been very fruitful in terms of positive experimental outcomes that suggest the existence of psi. However, it has not been possible to integrate this body of results into an appropriate biological framework rooted in evolutionary biology. Some interesting attempts have been proposed throughout the last few decades, but almost all draw their interpretations from an anthropocentric perspective. Here, by means of an approach known as consilience of inductions, I try to overcome this problem by analyzing complementary evidence from different disciplines that point toward a common conclusion: that psi might be an ancestral capability widely distributed in many non-human organisms. Such pieces of evidence are the following: 1) That psi is not paranormal but natural and normal, as indicated by the historical record and by recent surveys applied to people around the world; 2) The reports that suggest the presence of psi in domestic and non-domestic animals, including the positive results of a large number of animal psi experiments; 3) Common brain structures to all vertebrates, which take part in certain functions and processes that have been associated with psi; 4) The apparent role of the outer layers of the brain—which are recent evolutionary innovations mainly developed in primates—in the inhibition of psi function; and 5) The evolutionary advantages that psi might confer in many human and non-human organisms, mainly those related to survival. Altogether, these pieces of evidence point towards a scenario in which psi emerged long ago, perhaps before the divergence of vertebrates, and in which it might have been preserved by biological evolution given the obvious advantages that could represent for organisms, even if it operates in an unconscious way. Furthermore, many experimental results in the field of parapsychology suggest that one specific kind of natural selection, known as stabilizing selection, might be operating behind the evolution of psi or, more specifically, its biological bases. Finally, I point out that, if we want to unravel the neurobiological bases of psi function, it is crucial to start focusing on brain regions or structures widely distributed in vertebrates and, from here, it would be possible to try to identify the genetic bases of this extraordinary function, which in turn would allow us to elucidate its evolutionary history.

KEYWORDS

Psi function, evolution, consilience of inductions, biological basis of psi.

INTRODUCTION

Since its establishment as a scientific discipline, Parapsychology has been surrounded by multiple criticisms and controversies. Besides, it is not uncommon to hear that, over almost a hundred years, there has been no positive result within this academic discipline. These are the kinds of criticisms that usually come from people outside the field who either speak from ignorance or even from bad faith. However, when we look at the data, we observe a completely different situation. From the beginning, positive results have been obtained for thousands of different experiments, and different meta analyses point towards the same overall conclusion: although no consensus has been reached on its nature or its explanatory mechanism, psi (or psychic) phenomena are real and the probability that the observed effects are due to chance alone is extremely low (usually on the order of millions to one or even billions to one) (Cardeña, 2018; Mossbridge et al., 2012; Schmidt, 2012; Storm, 2006a, 2006b).

One of the limitations for parapsychological research is that it has not been able to incorporate its extraordinary advances within a theoretical framework that is anchored to biology, and even less so within the framework of evolutionary theory. Nevertheless, several efforts have been made to try to visualize psi as a product of biological evolution, particularly by analyzing its potential role in survival and adaptation. Broughton (2010) suggested that "anomalous intuition" —a kind of intuition related to extrasensory perception (ESP)—may come from adaptive mechanisms that enhance decision-making under unpredictable conditions by making use of unconscious emotional memories and episodic memory. This form of intuition is argued to have provided early humans with foresight, a very important trait to be able to cope with complex environments. Similarly, Taylor (2003) proposed his "Evolution's Need Serving Psi" model, a neo-Darwinian framework that places psi as a biologically advantageous—though imperfect—ability that operates in an unconscious way. He postulates that psi may have evolved to serve specific needs by selectively scanning for need-serving information relevant to survival, like potential threats or necessary resources. Further supporting this view, Broughton (2006) emphasized the role that the emotional system might have for facilitating receptive psi and proposed that evolution might have co-opted emotional processing pathways to integrate anomalous information in a way that mimics natural, unconscious responses to environmental stimuli.

Psi has also been tightly intertwined with the evolution of beliefs (particularly religious ones) and psychological traits, mainly those that could enhance social cohesion and individual psychological resilience. For example, McClenon (1997) argues that early shamanic rituals, which employed altered states of consciousness (ASC) and hypnotic suggestions and were central to the survival of early human groups, selected for hipnotizability-related traits, which heightened individuals' susceptibility to therapeutic and religious experiences. Kelley (2010) extends this view by suggesting that beliefs in God, spirits, and paranormal phenomena likely evolved to alleviate death anxiety—a threat for psychological well-being—and played a role in managing existential stress, thus fostering resilience. Kennedy (2004), on the other hand, suggests that, given that the manifestation of psi often occurs independently of self-interest, serving material needs may not be psi's main purpose, but rather fostering broader consciousness and enhancing a sense of connectedness and meaning. Complementing these views, Kelley (2011a) suggests that certain traits related to beliefs in paranormal phenomena, such as transliminality and positive schizotypy, which seem to be linked to creativity and mating success, may represent adaptive genetic polymorphisms which might have contributed to reproductive success. Together, these theories highlight how psi-related beliefs may have evolved to support psychological traits advantageous for survival and adaptation within a social and cultural context.

I consider these attempts to build a bridge between biology and parapsychology to be extremely valuable and by no means do I intend to underestimate their importance. But there is one issue present in many of them which, in my opinion, has contributed to evolutionary approaches not fully permeating parapsychology: a mostly anthropocentric view greatly based on countless human testimonies of spontaneous psi experiences and on the positive outcomes of experiments in which humans are the experimental subjects. By this I mean that, most of the time, it is assumed that psi is a trait that arose in *Homo sapiens* or in an immediate ancestor of ours. But, as we will see in the next sections, there is an enormous body of evidence with non-human animals which suggests that psi is not an exclusively human trait, but in fact may be much older than is often thought.

A THEORETICAL PROPOSAL BASED ON CONSILIENCE OF INDUCTIONS

Here I will try to build a coherent framework that considers psi as a product of biological evolution, even though we are still uncertain about its biological basis. My attempt

will be through a method known as consilience of inductions, originally proposed by the philosopher William Whewell (1847) and which refers to the convergence of pieces of evidence coming from different, independent sources, to support a theory or scientific explanation. In other words, if two or more sequences of inductive reasoning from apparently distinct classes of phenomena point towards the same conclusion, we can say that a consilience of inductions has taken place (Laudan, 1971).

One of the strengths of this approach is that it relies heavily on the use of different methodologies which can either come from the same field or from very different ones, making it some sort of safeguard against biases or methodological impediments that would be limiting if we were to consider evidence from a single field.

Consilience of inductions can be used in virtually every branch of knowledge, but it has proven to be extremely efficient in historical disciplines like cosmology or biology, especially when dealing with phenomena that occurred a long time ago and for which direct evidence is nearly impossible to obtain. This is precisely the kind of problem we are dealing with here, i.e., the possible emergence and evolution of psi capabilities. But before continuing, I find it necessary to illustrate the use of consilience of inductions and how it integrates different pieces of evidence in two of the most important scientific problems within the natural sciences: the Big Bang theory and the theory of evolution by natural selection.

The Big Bang theory, perhaps the most influential theory in the field of cosmology, explains the origin and evolution of the universe, proposing that it began almost 14 billion years ago from a massive explosion which caused the expansion of space itself and led to the formation of matter and all cosmic structures that we observe today. Though it is impossible to obtain direct evidence to confirm that it actually happened, evidence from multiple independent sources give a well-supported conclusion to this theory, including: the prediction about the amounts of light elements like hydrogen, helium, lithium, and others resulting from Big Bang nucleosynthesis, which aligns with observed cosmic abundances (Steigman, 2006); the shifting of light from distant galaxies toward the red end of the electromagnetic spectrum, which indicates that they are moving away from us and suggests that the universe is expanding (Bahcall, 2015); and the cosmic microwave background radiation, a kind of faint, uniform radiation considered to be a snapshot of the early universe (circa 400, 000 years after the Big Bang), when it cooled enough for atoms to form and light to travel freely (Gawiser & Silk, 2000), aligning with the proposal of a hot, dense beginning of the cosmos.

The theory of evolution by means of natural selection, proposed by Charles Darwin in his seminal book *On the Origin of Species* (1859), and which is the most successful theory of biological evolution, is also greatly supported by an approach in which multiple evidence from different fields converge into the two main points of it: that living beings share a common ancestry and that life has diversified through a gradual process of adaptation. In this case, the progressive change of related organisms observed in the fossil record, the presence of homologous structures across different species, the distribution of species across the planet, similar patterns in development of embryos from different species (Lloyd, 1983), and the fact that all known life (both extant and extinct) share the same DNA-based inheritance mechanism (Alberts et al., 2014), virtually the same genetic code, and multiple genes with conserved functions (Koonin & Wolf, 2010), show how traits are passed down and modified over countless generations, and constitute independent lines of evidence that cross-validate Darwin's theory of evolution.

I hope these two examples have captured the logic behind consilience of inductions. In the next sections I will take a similar approach and present several lines of evidence from different fields which, in my opinion, give some support to the idea that psi is a capability well rooted in biology. Though we still lack a consensus explanation on how psi might operate, which is not a minor issue and deserves detailed investigation, this is far beyond the scope of this paper.

LINES OF EVIDENCE POINTING TOWARD A BIOLOGICAL BASIS OF PSI

Psi Is Not Abnormal nor Paranormal, but Natural and Normal

Although the formal, academic study of psychic experiences began less than a century and a half ago with the founding of the British Society for Psychical Research (SPR) by late 19th century, descriptions of these kind of phenomena date back thousands of years. Several cave paintings from prehistoric times depict strange and fantastical scenes which are suggested to have been the result of hallucinations experienced during altered states of consciousness (Ustinova, 2011). For thousands of years, psychic experiences seem to have played a pivotal role

in the religious aspect of primitive societies. In his classic work on shamanism, Mircea Eliade (1964) pointed out that many of the wonders performed by shamans, both in ancient and present-day societies, occur under a modified state of consciousness in which one or more psychic experiences take place (e.g., divination or healing). In classical antiquity, the art of divination, which involved a mixture of phenomena like telepathy, clairvoyance, and precognition, represented a valid source of knowledge from which leaders and rulers often made important decisions (Dodds, 1946; Struck, 2016). Visual and/or auditory hallucinations have also played important roles in the shaping of more recent and organized religions such as Christianity (Lukoff, 2007), specifically the visions which are described by different prophets. More recently, at least since the end of the 17th century, stories of ghost and apparitions had become common among the British (Sangha, 2019), and the first academic journals dedicated to the serious study of psychic phenomena appeared decades before the founding of the SPR (Alvarado et al., 2006). Overall, this constitutes solid evidence that psychic phenomena are nothing new but have been experienced by people around the world over thousands of years.

Since the establishment of Parapsychology as an academic discipline in the early 30s of the twentieth century, there has been a lot of criticism from the skeptical and academic community. These critics have targeted different aspects of parapsychological research, from the researchers' integrity to flaws in experimental design and the analysis of data. But perhaps the more problematic of these arguments has to do with the very nature of psychic experiences. For decades, many researchers in mainstream academia have argued that this sort of experiences are nothing more than the product of suggestion, sensory hyperacuity, fraud, hallucinations, among others (Rawcliffe, 1959), or that they are just delusions resulting from the way some people interpret stimuli that cannot be discerned right away (Lange & Houran, 1998), and are often associated with deficiencies in emotional regulation, strong confirmation biases, and histrionic and catastrophizing reactions (Houran & Laythe, 2022). This way of thinking is illustrated in proposals like the "cognitive differences hypothesis" (Blackmore, 1992), which states that differences in psychic beliefs in different people, particularly skeptics and believers, might shape the way they process information about the world. However, when this hypothesis was tested, no differences were found in tasks related to working memory capacity, autobiographical memory distortion, and episodic memory distortion (Gray & Gallo, 2016), which are somehow related to belief in the paranormal. The only differences between skeptics and believers were found in those tasks that required analytical or logical thinking, in which skeptics showed higher results.

What belief in the paranormal does seem to be positively correlated to is having had subjective paranormal experiences (Glicksohn, 1990; Spinelli et al., 2002; Wahbeh et al., 2018). Glicksohn (1990) identified a positive correlation between the degree of absorption (i.e., the tendency to get deeply immersed in one's experiences), the experience of altered states of consciousness, and having had paranormal experiences. More recently, researchers looking for the incidence of exceptional human experiences (EHEs) found that a little bit more than 85% of respondents from the general population have had at least one EHE. They also compared the incidence of the general-population sample with one of scientists and engineers and found a strikingly similar result (Wahbeh et al., 2018). Besides, about 40% of them also reported having family members who also had EHEs. Positive correlations between paranormal belief and a positive outcome in psi experiments have also been found in some meta-analyses of forced choice, sheep-goat ESP studies (Storm & Tressoldi, 2017), although other researchers have not detected any correlation at all in experimental protocols (Hitchman et al., 2012).

Other proposals have tried to link belief in the paranormal with schizotypy, a spectrum of personality traits widely distributed in the general population that, at one extreme, can be associated with magical thinking, imaginative states, and creativity (commonly known as positive shizotypy), while at the other end is associated with severe symptoms like delusions, disorganized thinking, and social disfunction (negative schizotypy) which can indicate the possible presence of a severe mental disorder like schizophrenia (Kelley, 2011a). But although a close relationship between belief in the paranormal and schizotypy has been detected in different studies (Hergovich et al., 2008; Kelley, 2011b), it would be wrong to extrapolate this to reductionist arguments that flatly claim that people with mental disorders are more prone to resort to paranormal explanations to unusual experiences. In fact, it has been shown that people falling under the "happy schizothypy" category, characterized by the absence of psychopathology, show a higher psychological well-being, can easily incorporate belief in the paranormal and subjective anomalous experiences into their lives, and had better

mental health than people who lack schizotypal traits (Holt et al., 2008).

A relationship between schizotypy and psi performance has also been suggested, but in this case, it doesn't seem to be very clear, unlike what happens with the relationship between schizotypy and belief in the paranormal. In a study involving a group of positive schizotypes and another comprising negative ones, only non-significant differences were found between both groups in the Ganzfeld protocol and in a waking ESP condition (Simmonds-Moore & Holt, 2007), which suggests that psi performance may not depend on schizotypy at all.

The evidence presented so far suggests that having psychic (or paranormal) experiences is correlated to the degree of belief in the reality of such experiences, and that has nothing to do with being mentally unhealthy. This last idea, which is often held by skeptics denying the reality of psi phenomena, seems to be based more on prejudice than on actual evidence. In other words, we can safely discard the idea that only mentally ill people report this kind of experiences. And this acquires much greater support by looking at the evidence from surveys that have assessed the incidence of these experiences in different populations. In the U.S., for example, from a sample of about 1,000 people, more than half of them reported having had at least one psychic experience throughout their lives (Palmer, 1979). A similar percentage of psi experiencers have also been found for Icelandic and British samples (Haraldsson, 1985). Subsequent studies involving samples of people from different countries reveal that between 25 and 60% of the respondents have had at least one experience involving telepathy, clairvoyance or contact with the dead (Haraldsson & Houtkooper, 1991; Haraldsson, 2011). This high percentage of people reporting psi experiences was obtained by asking respondents if they have had *any* kind of those experiences. However, when analyzed individually by type of experience, there are some for which the percentage sharply falls, though others still retain high values of around 20-30%. And there even might be differences when dividing the sampling into different regions of the same country. This is exemplified by a study in Scotland which investigated the incidence in the population reporting the presence of "second sight", an ability typically related to tragic events, which features the occurrence of visions of events that are occurring at the moment (clairvoyance), shortly before they happen (precognition), or the feeling that someone very close has been killed or injured (telepathy). In one region of the country only 10% of people reported having this ability, while in the one with the highest incidence it was 33% (Cohn, 1994). Still, the fact that about a quarter of a given population reports having had psychic experiences is anything but rare or abnormal and helps us to refute the idea that psi experiences mostly happen to "sick" people. If this was the case, it would imply that from a quarter to more than half of a given population has some sort of mental illness involving hallucinations, cognitive or perceptive distortions, and delusions, which is totally far from reality. For example, the global prevalence of schizophrenia and schizotypal personality disorder, conditions that skeptics typically associate with a high incidence of psi experiences, are less than 1 and 5%, respectively (Charlson et al., 2018; Rosell et al., 2014).

The Distribution of Psi Across Different Species

For some people, the widespread distribution of psychic capabilities in humans around the world and throughout history could represent the best proof that psi is anything but paranormal or the product of a malfunctioning brain. However, this would be equivalent to taking a few frames from a long movie and believing that they represent the entirety of that movie. In other words, this would imply that the ability to obtain information by anomalous means and to affect matter directly with the mind is an exclusive trait of the *Homo sapiens*. Initially, this is a reasonable conclusion, but what about the many other species in which some levels of psi have been detected? Of course, some might argue that these results are somehow flawed, or that they are more likely to be the product of the researcher's own psi (experimenter effect), but the accumulated evidence is just too big to disdain it with explanations that have to do more with researchers' biases than with an objective examination of the data in an evolutionary framework.

The formal investigation of the possible psychic capabilities of animals could be traced back to the second quarter of the last century. In fact, J. B. and Louisa Rhine were among the first researchers who tried to evaluate this ability in companion animals in a controlled, objective way (Rhine & Rhine, 1929a, 1929b). The Rhine's also, some years later, encouraged other researchers not to be limited only to studies with humans but to include other organisms, which over time could help to shed light on questions regarding the brain structures that could mediate psi function, the advantages for different organisms, the evolutionary origins of psi, among others (Rhine & Feather, 1962). During the years leading up to this call, as well as in the decades following, different studies that tried to

evaluate the presence of psi in companion animals were carried out, some of which are summarized in Table 1. Besides, as happens with human psi experiences, a great number of pet owners have reported behaviors in their companion animals that suggest the involvement of psi (Sheldrake, 2011). However, as some critics have pointed out, the close emotional bond between humans and their companion animals could be hindering the objective evaluation of psi's presence in these organisms, leading to false positives attributed to the experimenter effect (Dutton & Williams, 2009), or there could even be an intertwining occurring between the person's own psi and that of the animal (White, 1976a, 1976b).

One way to try to overcome the problems mentioned above has been the development of experimental protocols in which the researcher has minimal or no emotional relation to the organisms under study. This has resulted in numerous published results in which researchers claim to have found some evidence of psi-related processes in a wide diversity of organisms other than the typical pets, such as annelids (Wildey, 2001), arthropods (Metta, 1972; Lépes, 1992; Schmidt, 1970), and even in unicellular organisms like the protist *Paramecium aurelia* (Johnson, 1982; Richmond, 1952). Even so, most of the experimental evidence of psi's presence in non-human organisms comes from animals with which people usually interact in one way or another, such as fish (Braud, 1976; Morris, 1967, 1977), birds (Alvarez, 2010, 2012; Green & Thorpe, 1993; Peoc'h, 1988), small mammals (Chauvin, 1968; Duval & Montredon, 1968a, 1968b; Schouten, 1972) and even reptiles (Watkins, 1971). This is summarized in Table 2. By looking at the experimental protocols, we find out that almost every known psychic ability (mainly telepathy, clairvoyance, precognition, and Micro-PK) has been

Table 1. Evidence of Psi in Non-Human, Companion Animals.

Animal Under Study	Psi Ability or Phenomenon Under Study	Brief Description	Statistically Significant Evidence?	Reference
Dog	Psi-trailing	A dog named "Bobbie" got lost in Indiana while their owners were there on vacation. After six months of returning without the dog to their hometown in Oregon, the dog suddenly showed up. He must have travelled about 3,000 miles from Indiana to Oregon	—	Alexander, 1926
Horse	Mind reading / Telepathy?	It was tested if a horse named Lady could answer to the thoughts or intentions involving mathematical problems. At first the horse had a good relationship with her owner, but in the final stages the owner was so stressed that his treatment of the horse had changed. This situation remained when, on year later, a second series of experiments were performed.	Yes** (First round of experiments) No (experiments performed one year later)	Rhine & Rhine, 1929a, 1929b
Dogs	Telepathy	This study explores the possibility that a couple of dogs could telepathically receive orders from their owner and other persons, and carry them out.	Yes**	Bechterev, 1949
Dog	Clairvoyance	The dog named Chris was trained to associate each of the five different Zenner cards with a number. He gave a number of paws equal to the number associated with each card. When someone asked about which number was associated with a face-down card, he pawed the correct one.	Yes**	Wood & Cadoret, 1958
Dogs	Detection of buried land mines	Empty land mines were buried in the sand, under a shallow beach. The dog indicated which specific section the mine was buried by sitting over it.	Yes	Rhine, 1971
Cockatiels	Anticipatory behavior	A group of six cockatiels who began to chirp loudly when their owner was beginning the journey back home. They chirped many more times at that specific moments than under any other situation, like when someone knocked the door and the phone rang. The animals were videotaped during all the days that the experiment lasted.	Yes	Sheldrake, 2011
African Grey parrot	Telepathy	An African Grey parrot named N'kisi was able to say words (from a repertoire of more than 700) related to what it's owner was thinking at that moment. During the experiments, the owner and the parrot were separated in different rooms and floors. A randomly-chosen picture was given to the owner and, at the same time, the parrot's vocalizations were recorded.	Yes	Sheldrake & Morgana, 2003
Dog	Anticipatory behavior	Jaytee, a terrier owned by Pam Smart, was tested because he could apparently tell the time his owner was leaving for home, or when she set the intention to do so. Different experiments were carried out, including some in which the place the owner would visit on a specific day, as well as the time in which she was supposed to leave back home, were randomly chosen. The dog was videotaped continuously during the experiments.	Yes	Sheldrake & Smart, 1998, 2000a, 2000b

Here is a summary of some of the studies that have attempted to evaluate the presence of psi under conditions as similar as possible to the animals' familiar environment.
**Indicates that statistically significant results were obtained but only for some of the trials.
—Indicates that no statistical analyses were performed.

tested in more than one of these groups of organisms, which not only suggests that these abilities may not be exclusive to humans but also that they might have arisen in ancient times.

By looking carefully at Table 2, it is obvious that most experimental protocols have been performed with non-human animals belonging to the vertebrate clade, which happens to be the same to which the *Homo sapiens* belongs. In other words, fish, reptiles, birds, humans, and other mammals are evolutionarily related and we all share a common ancestor. Thus, although it is practically impossible to establish a point in time for the appearance of psi, we can suggest that, at the very least, it could have been present *before* the divergence of vertebrates. And we would not expect for psi to operate and be manifested in other vertebrates in the same ways that occur in humans. The fact that one morphological or functional trait is present in different, evolutionarily related species, does not mean that it has to be identical. Think about, for example, the arm of a human, the fin of a whale, the leg of a frog, and the wing of a bat. On the outside, these characters would seem so different that we could initially think that there is no evolutionary relationship between them. But by looking at them more closely, specifically at the bones that make them up, we would find that they share the same components (i.e., the same bones), which have undergone important

Table 2. Experimental Evidence of Psi in Non-Human Organisms.

Animal Under Study	Class	Phylum	Psi Ability or Phenomenon Investigated	Statistically Significant Evidence?	Reference
Paramecium	Oligohymenophorea	Ciliophora	Precognition	No**	Johnson, 1982
Paramecium	Oligohymenophorea	Ciliophora	PK	No**	Richmond, 1952
Stylonychia	Spirotrichea	Ciliophora	Mental influence	No	Randall, 1970
Planaria	Turbellaria	Platyhelminthes	Precognition	Yes	Alvarez, 2016
Earthworms	Clitellata	Annelida	Precognition	Yes	Wildey, 2001
Flies	Insecta	Arthropoda	Telepathy	Yes	Lépes, 1992
Butterly larvae	Lepidoptera	Arthropoda	PK	Yes	Metta, 1972
Cockroaches	Insecta	Arthropoda	Micro-PK	Yes	Schmidt, 1970
Woodlouse	Malacostraca	Arthropoda	Mental influence	No	Randall, 1971
Aggressive tropical fish	Actinopterygii	Chordata	Micro-PK	Yes	Braud, 1976
Non-aggressive tropical fish	Actinopterygii	Chordata	Micro-PK	No	Braud, 1976
Goldfish	Actinopterygii	Chordata	Precognition	Yes	Morris, 1967
Goldfish	Actinopterygii	Chordata	Precognition	No	Morris, 1977
Lizards	Reptilia	Chordata	Micro-PK	Yes	Watkins, 1971
Chicks	Aves	Chordata	Micro-PK	Yes	Peoc'h, 1988, 1995
Chicks	Aves	Chordata	Micro-PK	No	Johnson, 1989
Chicks	Aves	Chordata	Micro-PK	No**	Green & Thorpe, 1993
Bengalese finches	Aves	Chordata	Precognition	Yes	Alvarez, 2010
Zebra finches	Aves	Chordata	Micro-PK	Yes	Alvarez, 2012
Gerbils	Mammalia	Chordata	Mental influence	No**	Randall, 1972
Gerbils	Mammalia	Chordata	Clairvoyance	Yes	Parker, 1974
Rats	Mammalia	Chordata	Precognition	No	Hewitt et al., 1978
Mice	Mammalia	Chordata	Precognition	Yes	Duval & Montredon, 1968a, 1968b
Mice	Mammalia	Chordata	Precognition	No	Terry, 1976
Mice	Mammalia	Chordata	Clairvoyance / Telepathy	Yes	Schouten, 1972
Mice	Mammalia	Chordata	Micro-PK	Yes	Chauvin, 1968
Cats	Mammalia	Chordata	Clairvoyance	Yes	Osis & Foster, 1953

Here are included those studies in which the presence of psi was evaluated under conditions that were as controlled as possible. If we consider the results as a whole, we can see that virtually all psi manifestations detected in humans are also present in non-human organisms.
**Indicates that, although no overall significant results were obtained, there were some individuals/trials which yielded a statistically significant outcome.

modifications throughout their evolutionary history. In a similar way, psi-related behaviors in other species might be different to what we observe in humans and could be operating under specific conditions (Sheldrake, 2015), though the basic core of abilities (clairvoyance, precognition, telepathy, etc.) seems to be present in many non-human organisms (Table 2).

The Possible Anatomical Basis of Psychic Function

Throughout the last decades, once there was sufficient evidence in favor of psi, parapsychologists began to delve into the next obvious question: if psi was real, then what brain regions/structures were involved in its execution? One of the earliest proposals was that the right hemisphere of the brain, which is involved in functions like visual and spatial processing, intuition and emotions, and creativity and imagination, among others, had a role in facilitating psi, and several experimental results involving the evaluation of the outcome at psi tasks in people in whom one or the other of the cerebral hemispheres dominated, initially seemed to support this hypothesis (Andrew, 1974; Braud, 1975). However, considering the accumulated results on this line of research, there doesn't seem to be conclusive evidence supporting the view that people in whom the right brain hemisphere is dominant are better at psi tasks (Alexander & Broughton, 2001; Broughton, 1984, 2015).

From an evolutionary framework in which psi is not exclusive to humans, there is a crucial problem with hypotheses that associate it with the dominance of one brain hemisphere: differences at the hemispheric level are mainly associated with the neocortex, which is one of the most recent structures in the evolutionary history of vertebrates and is exclusive of mammals (Kaas, 2019). Recent evidence reveals that the basic neuron types that are part of the neocortex are also found in basal vertebrates like reptiles, but their distribution and organization is widely different from what is observed in the mammalian brain (Tosches et al., 2018). A similar issue occurs with the corpus callosum, another structure that has been proposed to be involved in psychic function (Kelley, 2011a). The main argument behind this proposal is that it seems to mediate transliminality, i.e., the propensity for information, feelings and thoughts to transcend normal boundaries of perception, from the unconscious to the conscious mind and vice versa (Thalbourne & Houran, 2000), and which is a variable that correlates positively with anomalous beliefs, experiences, and abilities (Roxburgh et al., 2024). Despite the corpus callosum not being part of the neocortex (it mediates communication between brain hemispheres), it is a novel structure that appeared relatively late in vertebrate's evolution and is only present in eutherian (placental) mammals (Aboitiz & Montiel, 2003). Homologous, though much simpler structures have been detected in non-placental mammals (Suárez et al., 2014, 2018) and in some birds like pigeons (Letzner et al., 2016). Hence, if there is a brain structure involved in psi processes, it is most likely one that is present in most, if not all, groups of vertebrates.

One brain complex which has also been proposed as a candidate for psi mediation is the amygdala, given its role in the modulation of the emotional system, mainly the fight-or-flight response (Broughton, 2006), a physiological reaction to perceived danger which triggers the body to either confront (fight) or escape (flight) the threat. This response is a basic survival mechanism and is conserved across all vertebrates. But as happens with the corpus callosum, the amygdala *per se* is not evolutionarily conserved throughout vertebrate clade; it is restricted to mammals (Johnston, 1923), though amygdala-like complexes have been detected in virtually every other vertebrate including birds (Jarvis et al., 2005), reptiles (Lanuza et al., 1998), and even fish (Porter & Mueller, 2020). Unlike the corpus callosum, the basic structure, connections, and functions of the amygdala and amygdala-like structures are well conserved across the vertebrate clade (Janak & Tye, 2015), which in principle makes it a more suitable candidate for psi mediation. But there are at least two objections to considering this structure as the most viable candidate for mediating psychic function. The first one is that, despite being involved in a universal, vertebrate mechanism like the fight or flight response, there are considerable differences in the anatomical organization of the amygdala of tetrapods (including anuran amphibia) (Moreno & González, 2007), and the amygdaloid complex of non-anuran amphibians (Deryckere et al., 2023) and fish (Lal & Kawakami, 2022). The second objection has to do with the dependence of the amygdala and the amygdaloid complex on lateralization. Though every known vertebrate group shows some level of it, complex brain lateralization like the one found in humans and non-human mammals is considered a relatively late event in the evolution of vertebrates. According to Ehrenwald (1975), given the nature of psi processes, it is likely that the structure (or structures) mediating it is independent of lateralization, unlike superior mental functions. Therefore, it is important to try to look for candidate structures that are not

only highly conserved in all vertebrates but also do not depend (or barely) on lateralization.

Thus, more suitable candidate brain regions for the mediating of psychic function might be those subcortical, at the inner part of the brain, which function in a more bilateral, integrated way. One of such structures which fulfill those conditions, according to Ehrenwald (1975), is the reticular formation, a network of neurons that extends throughout the brainstem. This structure is involved in both basic life-sustaining functions and higher-order cognitive processes functions like pain control, integration of sensory inputs, cardiovascular function, regulation of sleep-wake cycle, regulation of arousal, vigilance, mediation of sympathetic effects during stress, regulation of reflexes and of crucial visceral functions, and filtering of sensory information (Al-Shaarawy et al., 2011; Ehrenwald, 1975; Traurig, 2008). It is precisely this last function which Ehrenwald (1975) considers the most important for psychic processing: the reticular formation could act as the first line of defense against the ever-flowing stimuli that are perceived by any kind of anomalous cognition and also as a barrier so that the organism is not constantly exerting motor impulses in the form of psychokinesis. The reticular formation is one of the most ancient portions of the brain (Balcells, 2015; Novak, 2008) and is widely conserved across all groups of vertebrates (Feinberg & Mallat, 2013), even in the primitive groups such as jawless fish (Ronan & Northcutt, 1998) and cartilaginous fish (Smeets et al., 1983).

Another set of brain structures which I consider that might be involved in psychic functioning are the basal ganglia, a group of subcortical nuclei that lie deep within the right and left hemispheres, near the base of the brain and adjacent to structures like the brainstem and the thalamus. As happens with the reticular formation, the basal ganglia do not depend on brain lateralization, are among the oldest structures of the brain, and are conserved in all vertebrates (Grillner et al., 2013; Stephenson-Jones et al., 2011) including cartilaginous and jawless fish (Wullimann, 2011). Among their functions we find motor control, action selection, emotional regulation, executive functions, and procedural learning (Lanciego et al., 2012; Rocha et al., 2023). More recently, brain processes that are usually associated with psi, such as decision making (Hikosaka et al., 2018) and intuition (Wan et al., 2012), have also been identified as dependent on the activity of the basal ganglia, specifically the caudate nucleus. This is quite striking because several decades ago, before the discovery of its role in processes like intuition and decision making, it was suggested that this structure was some sort of antennae which could mediate every ability related to anomalous cognition, such as clairvoyance and telepathy (Neal & Karagulla, 1983).

I think that at this point the logic of this proposal might have been envisioned. I have only mentioned some structures that may or may not ultimately have to do with psi processing, considering its location in the brain, its distribution and its relative antiquity. It is not a straightforward task to try to identify this sort of structures and, in the end, psychic function might be dependent on the joint action of multiple brain structures. However, if psi is indeed present throughout the vertebrate clade, we would expect both a subcortical and conserved brain structure in all vertebrates, such as the reticular formation or the basal ganglia, to be involved. I will expand on this in a later section.

Inhibition of Psi Function by Outer Layers of the Brain

In keeping with the previous section, it is clear that human psi is manifested in a very wide range of situations that go beyond survival-related ones, and it seems that certain people have some conscious control over it. This suggests that there might be additional brain regions that regulate the way in which psi-related stimuli are processed, in ways more complex than what we observe in other vertebrates. The most obvious candidate structure seems to be the neocortex, which comprises more than three-quarters of the human brain and is much more voluminous than in basal mammals and even in other groups of primates (Kaas, 2019).

The idea of the potential role of the neocortex in mediating psi-related stimuli is not new, and it could be traced back to the "brain as a filter" model. This hypothesis, originally proposed by Henri Bergson (1911) and William James (1929) posits that the brain acts as a filter for external information and prevents it from crossing to conscious awareness. It also impies that the brain does not generates consciousness, but instead narrows down a wider form of it which exists independently of the brain. While James did not suggest any specific brain region that could serve as a "valve" for filtering information coming from the outside, Bergson proposed the brain cortex as the most likely structure that could fulfill that role. More recently, neuroscientists like Alexander Luria (1973) and Karl Pribram (1973) expanded on Bergson's ideas and suggested that

this selective filtering might be mediated by the frontal and temporal lobes. During the next decades, experimental support coming from neurological and neurophysiological research with subjects that showed some kind of brain lesion, revealed some brain regions that might have a role in mediating psychic functioning, such as the right temporal lobe (Persinger, 2001), the right parieto-occipital region (Persinger et al., 2002), and the right parahippocampal gyrus (Persinger & Saroka, 2012; Venkatasubramanian et al., 2008).

Additional experimental support comes from a series of experiments performed by Morris Freedman and his collaborators throughout the past two decades, in which they have investigated the impact of frontal lobe lesions on the ability of individuals to influence the output of a Random Event Generator (REG). In the first series of them, two groups of subjects of six people each, one made up of people with frontal lobe injuries (experimental) and the other made up of six healthy subjects (control), were seated in front of a computer displaying an arrow on the screen and were asked to try to move the arrow either to the left or to the right, or to keep it at the center of the screen (baseline). The movement of the arrow was controlled by the output of the REG. The main finding of this work was that one of the subjects in the experimental group showed a statistically significant ability to move the arrow in the indicated direction, especially rightwards (Freedman et al., 2003). Though no other subject in this study obtained results that departed from chance, a replication attempt with the subject mentioned above was performed and, once again, statistically significant results were obtained across multiple blocks of trials but, as in the first attempt, only when the subject was asked to move the arrow to the right (Freedman, 2010).

Several years later, the researchers aimed to replicate their original findings, for which they recruited the subject who had obtained a significant outcome in their 2003 study, and another one who also had frontotemporal lobe damage. The experimental protocol was the same as in their previous study, and they also included a control group made up of subjects with no brain damage. At the end of the trials, both participants from the experimental group obtained significant results when asked to move the arrow in the screen to the right, and both exhibited considerably larger effect sizes in comparison to subjects from the control group (Freedman et al., 2018). The authors concluded that the frontal lobes, particularly the left medial middle frontal region, may act as a biological filter to inhibit psi, and that damage to this area seems to weaken that barrier, allowing for the enhancement of psi capabilities.

More recently, the authors took a step further and explored the possibility of finding the same effects in people with temporary brain lesions. To accomplish this, they recruited 108 healthy participants who were assigned to either the control group or one of two experimental groups. For participants in both experimental groups, the researchers applied repetitive transcranial magnetic stimulation (rTMS) to induce temporary lesions in the frontal lobe, specifically in the left medial middle frontal region for one of the experimental groups and in the right for the other one. Only participants in whom rTMS was induced on the left side of the brain showed significant micro-PK effects (Freedman et al., 2024) and, as in their previous studies, only those rightward intentions (i.e., getting the arrow to move to the right of the screen) produced significant results. This initially suggests that participants with temporary lesions in the frontal lobe may represent an enriched sample for further studies in which this effect can be replicated.

The final piece of evidence pointing in a similar direction involves a recent poltergeist-like case investigated by several UPIDE members in Mexico City, Mexico. It involves a married couple unaffiliated to mediumship, comprised by a 56-year-old man, referred to as HM, and a 45-year-old woman, referred to as LP. The case involves typical phenomena often found in poltergeist-like cases like raps and apports, but also others which are not so common, such as apports, which are mostly coins. Additional details on reported phenomena and research methodology can be found elsewhere (D'León et al., 2025). What the evidence so far suggests is that HM seems to be the main agent, around whom most of the strange phenomenology occur, but what is more interesting here is the way that detonated these phenomena that have been occurring since 2012. According to HM, one day of that year he was coming out of the shower, slipped and fell face down, hitting the floor hard. He was immediately taken to the hospital by his daughter and son, and there, neurological studies were performed that revealed an injury of about 3 mm at the frontotemporal lobe. HM told us that, although before his accident a few episodes of strange phenomena like moving or falling objects have occurred at his home, it does not compare to the manifestations that followed his accident at the bathroom. In fact, the first apport case that he ever registered came a few months after the brain damage was detected. Around that time, HM was also diagnosed with

epilepsy. However, recent neurophysiological analyses which were performed to him a few years ago, including EEG exploration and simple and contrasted MRI, turned out to be within normal parameters. Despite this, apport and other strange phenomena have continued to this day, at a similar rate as in the period in which we investigated this case (unpublished results).

Plausible Evolutionary Advantages of Psi

One of the most common arguments against the biological and evolutionary bases of psi is that, if it was a trait subjected to evolutionary forces, it should be consistent and able to use at any time (see Levin, 1996). Such kind of arguments come from a very simplistic view of biological evolution and implicitly assume that directional selection (i.e., a specific mode of natural selection which favors one phenotype, in this case, the volitional and effective use of psi) is the only evolutionary force and that, in order for a trait to be subjected to evolutionary forces, it must confer some direct advantage to the organism's fitness. This couldn't be more wrong, and there are plenty of examples of traits that do not confer any advantage to the organism, which have been preserved due to a variety of reasons. For example, non-functional copies of genes, which are known as pseudogenes, do not have any effect in the reproductive success or survival of an organism and have been preserved by neutral evolution (Sisu et al., 2014; Torrents et al., 2003). Other traits, such as polydactyly resulting from the Ellis-van Creveld syndrome in certain, often genetically-isolated human populations (Goldblatt et al., 1992) and color variations in island populations of some lizards (Runemark et al., 2010), seem to have been preserved by genetic drift, a process in which random fluctuations in allele frequencies in a specific population can lead to the fixation of traits that are neutral or even slightly deleterious. And there can also be some non-functional traits whose elimination hasn't occurred because they cause no deleterious effects and thus haven't been selected against. This is what happens with vestigial traits that are now just remnants of functional ones in ancestral populations, but its original purpose has been lost in modern ones, such as the human appendix.

In the case of psi, what the accumulated evidence (both from human and non-human animals) strongly suggests is that it indeed can confer an evolutionary advantage, even if it operates in an unconscious, non-predictable way. This is precisely the reason why it is important to put aside an anthropocentric view of it and begin to consider the possibility that it is a widespread trait in many other vertebrate species.

One way to address the above point is to try to look for those manifestations of psi that might have a role in survival and/or reproduction, as has been suggested by Broughton (2015) and Sheldrake (2015). For example, the feeling of being stared at, i.e., the capacity of many people to perceive when someone else is staring at them, is one of the best to fit in an evolutionary framework because it clearly could represent an advantage in terms of organism survival (think of a person that by means of psi suddenly detects that a potential aggressor is staring at them and can escape safe and sound from that place). Though it has mostly been studied between humans (Sheldrake, 2003), there is some evidence that people can also perceive when an animal is staring at them (Corbett, 1986; Cotrell et al., 1996) and of animals feeling people's gaze from a point where it was not possible for the animal to distinguish it directly (Cotrell et al., 1996).

Another behavior that might be psi-dependent is the apparent telepathic communication between nursing mothers and their babies, especially when their milk let-down reflex was activated. In cases in which the mother was away from her baby, the activation of their let-down reflex coincided with the exact moment in which the baby showed signs of distress (Sheldrake, 2002, 2003). This manifestation of psi may not be limited only to humans but also present in other mammalian species. For a mother that was away from her children, for example, looking for food, it would clearly be an advantage if her reflex was activated in the way that human mothers have reported, because she could return to her offspring. However, the let-down reflex might not be a requisite, especially if we consider that the lasting of the mammalian breastfeeding period goes from a few days in some species (e.g., small mammals such as rodents) to even several years as happens with elephants. The mother could leave their offspring even after the breastfeeding period has ended, but in any case, a telepathic connection at times that the offspring is distressed or in danger would clearly make a difference for the ensuring of their survival.

The final example for this section is the abundant, though mostly anecdotal evidence of animal premonitions, specifically those concerning natural disasters like earthquakes, avalanches (Sheldrake, 2011), and tsunamis (Sheldrake, 2005). Possible alternative, psi-independent mechanisms have been proposed, such as infrasound detection, seismic

vibrations, changes in water or air pressure, and changes in the electromagnetic field, but there are many extraordinary cases for which precognition seems to be the most plausible explanation (Sheldrake, 2011). Furthermore, this extraordinary behavior has been observed in many species that span all major groups of vertebrates, including fish, frogs, snakes, birds, rodents, elephants, and domestic animals like dogs and cats. As happens with the feeling of being stared at and the telepathic connection between mothers and babies, the ability to precognitively anticipate the outcome of a natural disaster has an obvious role in ensuring survival, in this case not only of an individual but even of a whole population.

What examples like the above suggest is that such spontaneous manifestations of psi processes seem to be related to the emotional system (Broughton, 2006, 2015), whose basic components are highly conserved in all vertebrates (Panksepp & Biven, 2012) and it is also essential for decision making, a process with a very important role in survival behaviors like fear and threat detection. Some theoretical frameworks like the psi-mediated instrumental response (PMIR) model indeed posit that psi has evolved as a survival mechanism that could mediate decision making in a goal-oriented, unconscious, and adaptive way (Stanford, 1974a, 1974b, 1990). Despite decision making in higher vertebrates like the *Homo sapiens* and other mammals is largely mediated by the cerebral cortex, other structures such as the basal ganglia in general (Ding & Gold, 2013) and the caudate nucleus in particular (Hikosaka et al., 2018) are also involved, not only in these organisms but also in the rest of the vertebrates.

The nature of psi processes, especially the spontaneous ones, has also been associated to different forms of intuition or subconscious awareness like hunches, gut feelings, impressions, etc. (Beloff, 1981; Radin & Pierce, 2015). Though intuition is a multicomponent process and seems to be mediated by different brain structures, including some very ancient like the amygdala and the hippocampus, more recently it has been shown that the basal ganglia—especially the caudate nucleus— also play an important role in the development of this function (Wan et al., 2012).

Overall, that psi-related processes like decision making and intuition are mediated by ancient, highly conserved structures like the basal ganglia is not only compatible with an evolutionary framework in which psi appeared at least some time before vertebrate diversification but also highlights its potential role in survival-related situations that would require a rapid, sometimes unconscious response.

IMPLICATIONS OF THE POSSIBLE BIOLOGICAL BASIS OF PSI FUNCTION

Taken together, the accumulated pieces of evidence which I have presented above point towards the following scenario: the ability to obtain information in ways which are typically labeled as "anomalous cognition", and perhaps also the capacity to interact with matter without exerting a known direct action on it, is likely to have emerged long ago—some time before the diversification of vertebrates—and it may have been preserved by biological evolution because it might confer an advantage for organisms, even if its execution is carried out in a non-volitional way, in situations where the organism's survival may depend on the outcome.

Of course, one could argue that psi might be much more ancient and that it appeared millions of years before the first vertebrates. Though this is certainly a possibility, this does not invalidate what I am proposing here. Trying to establish a specific point in time at which psi emerged is something that, as of today, we are far from achieving. To do so, we would require not only a broader repertoire of organisms in which psi has been reliably detected, but also the identification of genetic markers associated with psi-related brain structures. In other words, focusing primarily on vertebrates does not exclude the possibility of psi in other organisms; rather, it intentionally limits the problem to a well-known clade for which the available evidence is robust enough to allow meaningful hypotheses.

Indeed, despite candidate brain structures involved in the mediation of psychic function evolved at early stages in the vertebrate lineage (Grillner, 2021; Medina & Reiner, 1995), evidence from several ANPSI experiments suggests that psi might also be present in organisms ranging from protists (Johnson, 1982; Randall, 1970; Richmond, 1952) to various invertebrates, with a great deal of research conducted on arthropods (Lépes, 1992; Metta, 1972; Randall, 1971; Schmidt, 1970). This raises the intriguing possibility that psi in non-vertebrates might be mediated by traits that are not evolutionarily related to those of vertebrates. For instance, arthropods lack structures such as the basal ganglia, yet possess analogous structures involved in similar functions (Smarandache-Wellmann, 2016). Moreover, recent findings suggest that insects exhibit consciousness-related components analogous to those of vertebrates, which might contribute to subjective experience (Barron & Klein, 2016). On the other hand, homologous genes could also be playing a role across diverse taxa. For

example, planarians, a basal animal group in which psi phenomena have been tested (Alvarez, 2016), exhibit key neuronal features remarkably similar to those of vertebrates, to the extent that their protobrain has been proposed as an ancestral form of the vertebrate brain (Sarnat & Netsky, 2002). Furthermore, homologous genes involved in synaptic processes have been identified in both vertebrates and invertebrates (Nithianantharajah et al., 2013), and even in evolutionarily distant organisms like yeasts, where they participate in environmental responses and cellular organization (Emes et al., 2008). Although we cannot currently assert that these traits mediate psi, their presence underscores the possibility that similar neurobiological mechanisms—whether homologous or analogous—may exist beyond the vertebrate lineage. Thus, psi's biological basis in invertebrates could involve evolutionary-related (homologous) structures or processes to those observed in vertebrates, traits with similar functions that evolved independently (analogous), or perhaps a combination of both. Clearly, this is highly speculative and extends beyond the immediate scope of the present proposal.

Returning to the main discussion, and given our current knowledge, there are two alternative hypotheses regarding the evolutionary origins of psi capabilities in vertebrates. These hypotheses are, in principle, equally plausible: the independent origin and the common origin of psi. The first refers to psi appearing independently in each vertebrate lineage in which it has been detected (Figure 1A), representing a case of convergent evolution—that is, the process by which unrelated species independently evolve similar traits due to adaptation to similar environments or ecological niches. At present, we cannot categorically exclude this scenario; however, in my opinion, it faces significant theoretical challenges due to two main reasons. First, the fight-or-flight response, which has been strongly associated to the situations most conducive to the manifestation of psi in non-human animals (i.e., those related to ensuring survival) (Broughton, 1988, 2010; Taylor, 2003), is a process known to be homologous in all vertebrates (Romero & Gormally, 2019), and the neural circuits mediating it are highly conserved (Suryanarayana et al., 2022). Second, common brain structures to all vertebrates, which seem to be the most likely candidates for mediating psychic function, share the same overall structure and organization, which suggests that their basic components evolved only once throughout vertebrates' evolutionary history. This includes both the reticular formation (Manger, 2009) and the basal ganglia (Reiner et al., 1998). And there is also the issue regarding parsimony. In evolutionary biology, as in many other branches of science, when we are faced with two or more possible explanations, the one requiring the fewest number of changes is preferred when reconstructing evolutionary relationships. Though parsimony should not always be assumed as a rule of thumb for the best evolutionary scenario for a specific trait (Crisci, 1982; Wanninger, 2024), there have been many examples in which similar traits in different groups of evolutionary-related organisms—like wings in birds and bats or amniotic eggs in reptiles, birds, and mammals—were originally thought to have different origins, but when more evidence was uncovered it turned out that they did share a common origin.

Here I am arguing in favor of a single origin of psi at some point before the divergence of vertebrates (Figure 1B), given the common origin of the candidate ancient brain structures that are likely to mediate it and of the mechanisms that seem to be related to it, such as the fight-or-flight response and decision making (Branco & Redgrave, 2020; Ding & Gold, 2013; Romero & Gormally, 2019). Considering that we lack direct evidence of the biological basis of psi, opting for a parsimonious hypothesis involving a common origin prior to the divergence of vertebrates seems to be a good starting point, in part supported by the five pieces of evidence I have developed above.

The issue of the possible evolutionary forces behind the neural basis of psi will be discussed in a later section. Here, I will only mention that, although structures like the basal ganglia and the reticular formation share a common origin in all vertebrates and are conserved throughout their phylogeny, this does not mean that there were no variations between them, as if they have remained frozen in time since their appearance. Such differences between groups of vertebrates could be linked to: a) variation in specific anatomical features of involved brain components and b) different manifestations of psi in different groups of organisms, which could in principle be related to a).

Despite the wide spectrum in the degree of complexity of the vertebrate brain, there is a common core of components which is conserved in all of them at different levels (Eilbert, 2014), including genetic, cellular and connectivity ones (Karten, 2015). Primitive emotions like anger, fear, lust, search, care, among others, are also conserved throughout this clade (Panksepp & Biven, 2012). And even at the level of cognitive (Pessoa et al., 2019) and behavioral (Eilbert, 2014) processes there are neural networks which are conserved in many groups of them and that involve common brain regions. Regarding specific brain structures

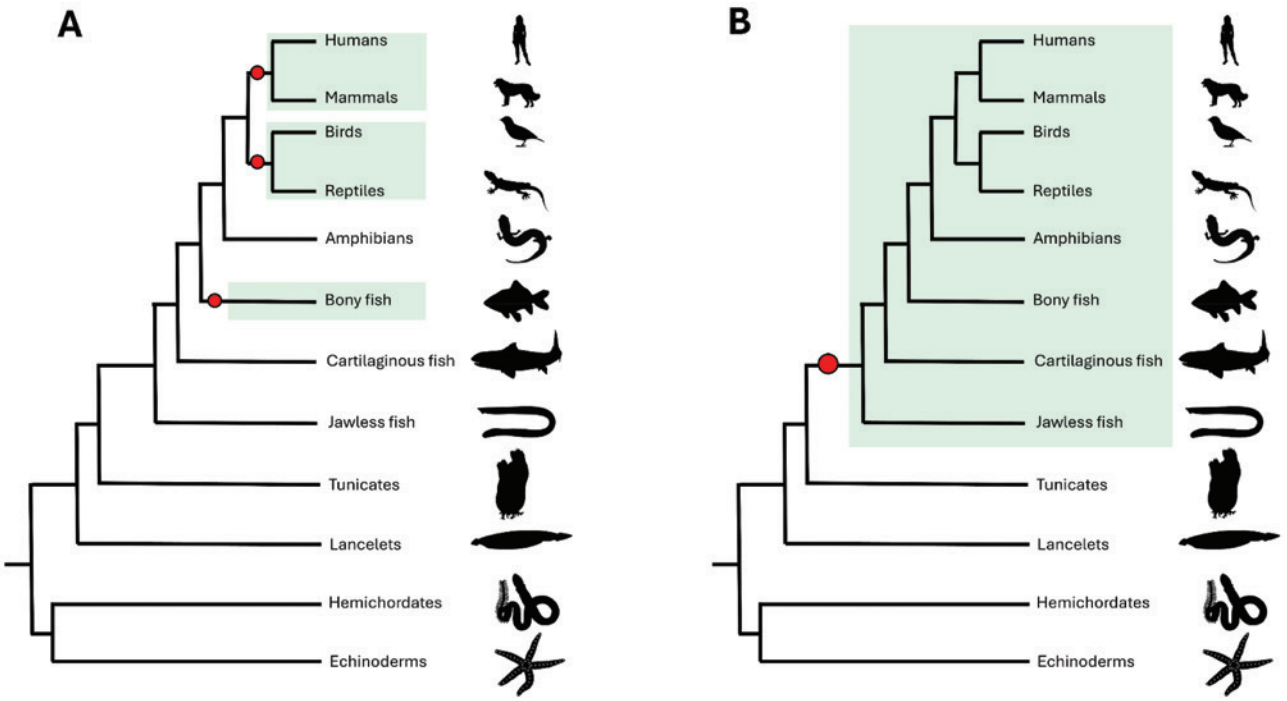

Figure 1. Two Possible Hypotheses for the Origin of Psi Function. In (A), it is assumed that psi evolved as a result of convergent evolution in each of the vertebrates' groups in which it has been detected (represented by a red circle). This scenario implies that psi appeared independently—at least—on three different occasions throughout the evolutionary history of vertebrates. On the other hand, (B) depicts a scenario in which psi had a common origin before the divergence of vertebrates, which is a more parsimonious one than (A) and coincides with the evolutionary history of brain structures like the basal ganglia and the reticular formation—both possible candidates for mediating psychic function. The fact that psi has not been detected in all groups of vertebrates may be because it has not been searched for in that group or because it has been lost in one or more lineages.

that might have something to do with psi, though the basic elements are conserved in all vertebrates, there are considerable differences which involve their specific organization, and the circuitry involved, both for the basal ganglia (Reiner et al., 1998) and the reticular formation (Manger, 2009). Such variations could, in turn, be linked to different expressions of psi capabilities in distinct groups of vertebrates, such as those proposed by Rhine and Feather (1962). By reviewing many case reports of pet owners, they identified five kinds of behavior that could be psi-related, including homing behavior, reactions to impending danger (both to the owner or the pet itself), anticipatory behavior involving the owner's return, perceiving the owner's death at a distance, and cases in which the animal managed to follow the owners over great distances and even to a place it had never visited before (psi trailing). Just as all vertebrates share the same, overall brain structures as the reticular formation and the basal ganglia, but with specific features in different taxonomic ranks, the same principle could be applied for psi capabilities. What is suggested in Table 2 is that the whole repertoire of known psi phenomena is present in the vertebrate clade, but each branch of them could show specific, psi-related behaviors, which might depend on the organization of their anatomical basis.

EVOLUTIONARY FORCES AND PSI

Until a few decades ago, the traditional view of brain evolution was based on the triune brain hypothesis, an oversimplified model which divides the brain into three regions: reptilian brain, which is the oldest and innermost part, comprising structures like the brainstem and the basal ganglia; the limbic system or "paleomammalian layer", in which we find the amygdala and the hippocampus; and the neocortex, the outermost and most recent layer which is usually called the "neomammalian brain" (Cory, 2000). Even though from the outside the central point of this theory would seem right, there are two main objections. Firstly, it postulates that the different layers of the brain operate somewhat independently. And secondly, it considers that some brain structures, especially those more ancient and which are in the reptilian brain, have

remained evolutionary stagnant (MacLean, 1990), as if the selective pressures acting upon them were so strong that no evolutionary change can be allowed.

Within the field of evolutionary biology, the triune brain hypothesis is no longer an accepted one, especially thanks to recent advances in neuroscience, comparative anatomy, genetics, and molecular biology. Different brain processes like emotion or cognition (both of which might be involved in psychic function) and their underlying neural circuits are no longer seen as separate and independent, but as interdependent and part of integrated functional networks (Steffen et al., 2022). Furthermore, it has been demonstrated that the innermost and oldest parts of the brain have not been "frozen in time", but rather have co-evolved alongside most recent, cortical structures (Chin et al., 2023).

What does this have to do with psi? The reason is that we cannot separate the possible evolution of this function from the changes that the brain structures that might mediate it throughout the evolutionary history of vertebrates have undergone. If we want to get a better understanding of the differences in psi capabilities across species, we also need to understand the processes that have shaped the necessary scaffolding for their operation. However, until further evidence is available about the biological basis of psi, proposing hypotheses about the possible evolutionary forces affecting any of the candidate structures is highly speculative.

At this point, the best we can do is to try to get a better understanding of the distribution of psi in the human population. Several meta-analyses that take into account hundreds, even thousands of different experiments within the field of Parapsychology (see Cardeña, 2018; Mossbridge et al., 2012; Schmidt, 2012; Storm, 2006a, 2006b) have provided enough evidence to establish that psi phenomena are real and not an artifact related to issues like measurement error or the file-drawer problem (Radin, 2006). For this purpose, there are two results that have been obtained consistently over time and that could give us a clue about how this trait might be distributed in the population. These are:

1. Most of participants in experiments that test for clairvoyance, precognition, micro-PK, etc., show some level of psi, including psi-missing.
2. Only very few subjects show no psi degree at all or, on the contrary, a very high degree.

In a graphical way, the distribution of this trait (having psi) would resemble a normal distribution in which, at the extremes, we would have those individuals with a total lack of psi and also those that would be considered true prodigies, whereas the central part of the distribution would comprise individuals showing some level of it (Figure 2A). Now let's take a look at it in an evolutionary framework. For the sake of simplicity, I will focus only on one aspect common to both humans and non-human animals: survival. As I stated above, ensuring survival is crucial for any organism, and what the evidence suggests is that psi-related processes might have something to do with it. Picture an herbivorous animal or an early *Homo sapiens* individual looking for food. Let us now suppose that this mammal is suddenly endangered due to the presence of predators in its surroundings and that the only way of getting away was by some sort of anomalous cognition exerted in an unconscious, non-volitional way (for example, perceiving the pack of predators at a distance and in real time). Evidently, this individual would have a higher fitness (and a higher chance of escaping) than another with a complete lack of psi. But also, more than one in which anomalous cognition was operating all the time. In this specific case, it is likely that the organism would not be able to distinguish which information fragment was needed to save its own life. In other words, there is a great chance that the important signal was lost in a sea of noise. Thus, having some basal level of psi, even if it only operated at specific situations, would be an evolutionary advantage if those situations were determinant for survival of the organism.

The situation described above agrees with a scenario in which stabilizing selection is the evolutionary force behind the shaping of psi function (Figure 2B). This is a specific type of natural selection that favors average traits within a population (in this case, organisms with some level of psi) and selects against extreme ones (organisms lacking psi and those in which it is present all the time) because those with the average phenotype are more likely to survive and reproduce. Stabilizing selection seems to be the most common evolutionary force acting upon many different, phenotypic traits (Estes & Arnold, 2007) and examples include the wing size in birds, human head size at birth, clutch size in reptiles, an intermediate fur color in some mice, among others.

Some critics against the reality of psi that have pronounced against its existence argue that if psi is so useful, and if it has been present for a very long time, by now we should see a lot of individuals in which this capacity was highly developed (Levin, 1996). As I argued above, this implicitly considers that directional selection is behind the evolution of psi capabilities. It would be more coherent if psi was a conscious process in which an individual could use her

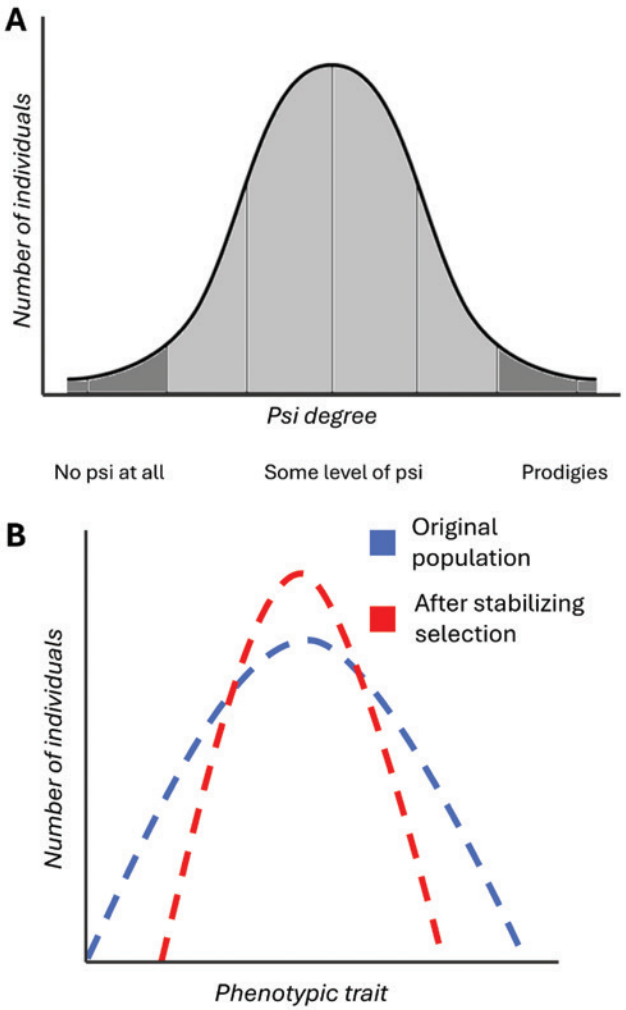

Figure 2. The Distribution of Psi in the Population as a Result of the Action of Evolutionary Forces. Based on the results of thousands of experiments, we can postulate that the distribution of psi in the general population resembles a normal one, with most people showing some level of it, whereas only a few would be true psi-prodigies or exhibit no psi at all (A). Such distribution suggests that stabilizing selection, a kind of natural selection which favors the intermediate or moderate phenotypes in a population while eliminating extreme variations at both ends of the spectrum (B), could be behind the evolution of psi function.

or his anomalous cognition at will. But again, if we look at the experimental and anecdotical evidence, this doesn't seem to be the case. Instead, it seems that individuals with intermediate phenotypes are likely to be more fitted because they could effectively use psi under situations in which their own life is at stake. Think about, for example, those individuals who avoid getting on a plane or taking a specific highway due to a gut feeling, hunch, etc., only to find out later that a fatal accident occurred in which they could have been involved had they made a different decision.

To close this part, I'd like to mention that, though what I have suggested is a generalization of a possible common evolutionary framework to human and non-human animals, there is certainly a greater complexity surrounding human psi, which has led to alternative and innovative proposals that aim to explain why this trait has been preserved over countless generations of human beings. One of them is the Ritual Healing Theory (McClenon, 1997), which suggests that group healing practices like shamanic rituals led to placebo and hypnotic effects that are correlated with anomalous experiences like spiritual healing, waking ESP, PK, among others. Such experiences seem to have fostered the belief in healing powers, which in turn promotes physical and mental health, resulting in shamanic practices and thus completing the cycle. McClenon argues that behaviors associated with ritual healing have played a role in human evolution by fostering social cohesion and belief systems that are centered on healing and anomalous experiences. The theory also states that such cycle has acted as a selective pressure, favoring genotypes associated with hypnosis-related features such as dissociation and absorption (McClenon, 2013).

The analysis of hundreds of reports of anomalous experiences supports the RHT over other theories that postulate that psi confers a direct benefit in the form of survival advantages (McClenon, 2000, 2002). However, the RHT might be untenable if we extrapolate it to non-human animals. With this I'm not trying to invalidate the RHT; it is likely that the processes it describes have occurred in human societies at least since the earliest forms of shamanic rituals and religious-like practices. In fact, there could be an interplay between selective forces behind the RHT and others related to the evolution of psi capabilities that are common to humans and non-human animals, which might involve additional brain regions, likely those with a high degree of development in humans but not in non-human animals. This seems to be in line with psi effects observed in subjects with brain damage in the neocortex, specifically in the frontal lobes, such as the ones participating in the experiments led by Morris Freedman and his collaborators (Freedman et al., 2003, 2018, 2024) which I described above.

IMPLICATIONS AND APPLICATIONS

This study proposes a novel framework for understanding psi phenomena by placing them within the context of evolutionary biology. By identifying brain structures and regions widely shared among vertebrates that could

potentially underlie psi capabilities, this work opens the door for experimental research. Behavioral scientists, neuroscientists, psychologists, and other experimental scientists could use this framework to investigate whether these regions are indeed involved in psi function, employing diverse techniques and studying various organisms.

Furthermore, the findings highlight the importance of integrating psi into a biological and evolutionary framework, rather than relying exclusively on mathematical models or speculative physical theories. By focusing on the evolutionary reasons for the existence of psi—such as its potential role in survival—this approach encourages the generation of testable hypotheses about its evolution and mechanisms. Ultimately, this perspective may help establish a more grounded and interdisciplinary path forward in the study of psi phenomena.

CONCLUSIONS AND FINAL PERSPECTIVES

What I have tried to do throughout these pages is to build up a comprehensive framework that could help to integrate psi into evolutionary biology, and to provide some arguments for a natural history of this outstanding capability. I hold firmly that, despite its extraordinary advances, modern parapsychology still lacks a proper biological foundation that goes beyond what we observe in human subjects. This seems to be reflected in the fact that, even though there is a huge amount of literature on animal psi (see Dutton & Williams, 2009 for an extensive review), it has not been given enough weight in the few attempts that have tried to explain the role of psi in evolution, nor in theoretical models that have attempted to explain its mode of action. Only a handful of researchers have taken this issue seriously, such as Jule Eisebund, who long ago suggested that, just as happens in humans, animal psi didn't seem to be restricted to a few prodigious individuals. Instead, given its apparent role, it was more likely to exist to a greater or lesser degree in all members of species in which it had been detected than only in a few "gifted animals" (Eisebund, 1966)—a proposal which implicitly reflects the role of stabilizing selection, as I have suggested occurs in humans.

The lack of an evolutionary framework also applies to research on the possible neurobiological basis of psychic function. As I have mentioned above, this is a topic that has been addressed by researchers from different areas of knowledge, but no consensus has been reached about the brain structures and regions that might be involved. I think that this could be due to two main reasons: 1) they are mainly looking for structures of recent evolutionary origin and 2) psi might be a process that is not limited to a specific brain region or structure, but rather operating in a more integrated, holistic way, which makes perfect sense from an evolutionary perspective. If psi was indeed around before the divergence of vertebrates into the current major groups, it would be naturally expected that, as different species evolved, the common core underlying all mechanisms that mediate psi function would be integrated into increasingly developed neural circuits—a scenario that clearly goes against obsolete views of brain evolution like the triune brain model.

If we want to advance in our understanding of the neurobiological basis of psi function, it is crucial to firstly reach a consensus on those brain structures that could be playing a role in such processes. The best way to do this might be using techniques that allow observing brain function in real time—such as functional magnetic resonance imaging (fMRI) which has been done for a couple of decades. As a result, several brain regions and structures have been proposed to play a role in psi-related processes, including the visual cortex (Bierman & Scholte, 2002; Standish et al., 2003), the anterior cingulate cortex, frontal superior areas, and the precuneus (Achterberg et al., 2005), the occipital region (Richards et al., 2005), and the right parahippocampal gyrus (Venkatasubramanian et al., 2008). However, other researchers have not been able to find any evidence suggestive of a psi-related neuronal response (Moulton & Kosslyn, 2008). Though I could not discard that those structures might actually have a role in mediating psi function—perhaps in joint action with more internal ones—it is important to point out that all of them are recent evolutionary innovations mainly developed in primates. Hence, my suggestion would be to try to observe the activity of deeper brain regions like the ones I have proposed above. This might be challenging for fMRI-based approaches, but the combination of techniques like Positron Emission Tomography (PET), Single-Photon Emission Computed Tomography (SPECT), and High-Resolution Structural MRI (for anatomical context) could prove to be useful.

Although the identification of such structures would be a tremendous step forward in our understanding of the biological basis of supernormality, it would only be the first one towards unraveling the evolutionary history of this exceptional trait. Once a consensus is reached, the next step would be to try to identify which gene products are expressed in those regions. This could be achieved by building gene expression profiles using microarrays and/or RNA sequencing (RNA-seq) techniques which, in addition to providing insights into gene function and regulation, can also shed light on the identification of conserved functions

across species and on how changes in gene regulation contribute to species diversity.

The final step would be looking for homologous gene sequences in other vertebrate species and then performing phylogenetic analyses with genes expressed in those regions. And thus, by comparing their distribution across different species and analyzing their substitution rates we could obtain a wider picture of their divergence times and evolutionary trajectories.

It was several decades ago when Theodosius Dobzhansky, one of the most influential geneticists and evolutionary biologists of the twentieth century, in an attempt to make a wake-up call for the integration of molecular biology with organismal biology, stated that "*Nothing in biology makes sense except in the light of evolution*" (Dobzhansky, 1964). In his brief essay, Dobzhansky cautioned his colleagues against a purely reductionist approach and asserted that genes and molecular mechanisms should be studied within the framework of evolutionary biology so that their roles in adaptation and diversity could be revealed. I think that following a similar, holistic approach could be what ultimately bridges the gap between parapsychology and biology, paving the way for new inquiries.

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BOOK AND MULTIMEDIA REVIEW

The Star Gate Archives: Reports of the United States Government Sponsored Psi Program, 1972–1995. Volume 4: Operational Remote Viewing: Memorandums and Reports

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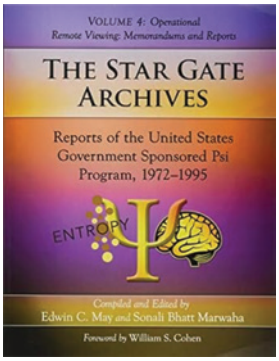

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I started to read the parapsychological literature in 2010 and found the evidence for psychic phenomena convincing. Since then, I have read and reviewed several books about remote viewing (RV), including the previous volumes in this book series (Mörck, 2018, 2019, 2020), but have remained unsure about the value of operational RV. This volume provides some evidence for operational RV. The Editors argue that it is significant that seventeen of the nineteen agencies that tasked remote viewers kept doing so. I don't find this argument convincing. The Editors themselves acknowledge that RV was generally used as a last resort. They provide brief summaries of a number of projects (pp. 34–45), and these combined with positive assessments from agencies indicate that operational RV worked—sometimes. However, as the Editors note and try to explain, evaluations of many projects are not available. In addition, redactions in the declassified documents can make it hard to assess the value of operational RV. The actual success rate is uncertain.

I have sketched out some of the background and context in previous book reviews. In 1972, the CIA provided the initial funding for RV research, and, in 1995, received responsibility for what was then known as the Star Gate project and decided to end it. The Editors argue that this was more due to budget-cuts and the scrutiny the agency faced than due to a lack of results (cf. May et al., 2015). The public had already learned about some of the efforts before the closure, due to, for example, Schnabel (1995) and *The Real X-Files*, which had aired on British Channel 4. It was arguably unthinkable for the CIA to continue with operational RV regardless of the final evaluation (i.e. Mumford et al., 1995). *The Star Gate Archives* allow the reader to follow the history up to the eventual closure of the RV project.

Richard Helms, who would go on to become Director of Central Intelligence, wrote a memo in 1963. He acknowledged that a group within the CIA had earlier concluded that "with minor exceptions, the fields of hypnosis, telepathy, and general control of human behavior were not ready for operational applications" but Helms noted that recent Soviet activity "may indicate more potential than we believed existed" (p. 76). The Cold War between the US and the Soviet Union was ongoing, and all possibilities had to be considered. Some years later, *Psychic Discoveries Behind the Iron Curtain* (Ostrander & Schroeder, 1970) became a bestseller.

In 1972, Russell Targ, a physicist, met Dr. Christopher Green ("Kit Green"), at the time with the CIA, to discuss parapsychology. Later, Dr. Harold Puthoff, another physicist, at Stanford Research Institute (SRI), at the suggestion of Targ, wrote to Green to describe

an informal test he had conducted with a psychic, Ingo Swann (p. 77). The interest generated by that letter led to the initial funding from the CIA. Parapsychology was considered to be "sensitive and controversial" (p. 111), but the CIA continued to provide funds for a few years. Kress (1977/1999) wrote an overview about the early years, when the CIA still provided funding. During this period the psychic abilities of others, in addition to Swann, including Uri Geller, Patrick Price, and Hella Hammid, were assessed.

Geller was a well-known psychic at the time, and the research with him provoked negative publicity (e.g., Jaroff, 1973). Geller had performed as a magician before and was regarded as being difficult to manage in the laboratory. People within the CIA believed that he had worked for Mossad, the national intelligence agency of Israel (Strausbaugh, 1996). Geller was not the ideal participant. Swann was easier to manage and had a desire to learn more about his psychic abilities. Price described himself as a patriot eager to fight communism (p. 101). Hammid was a friend of Targ and was originally brought in to serve as a control subject but turned out to be a good remote viewer.

Someone within the CIA noted that the utility of psychic phenomena "would be in direct proportion to the degree to which the skills could be learned or the powers acquired or developed by appropriate persons ..." and on the researchers' ability to identify persons with "the essential attributes" (p. 79). Much research would concern this, even after the CIA had ceased to provide funding. However, the Editors argue that, despite their best efforts, the researchers failed to develop "a valid psi training methodology" (p. 9) or prove that promising subjects could be identified by other means than through tests of their psychic abilities.

There were several reasons for the withdrawal of the CIA. There was no consensus within the agency. However, occasional remarks indicate that personnel from the CIA were not always satisfied. For example, in a Trip Report, someone noted: "It appears as if Targ and Puthoff may at long last understand that we are interested in good documentation of the methodology backed by data rather than anecdotes" (p. 100). Earlier adverse publicity was also concerning, and fears about future publicity. Later, others would also come to worry about this risk.

Wilhelm (1976) revealed that the CIA had been interested in the research. He also published an article in the *Washington Post* (Wilhelm, 1977). Due to this the House Permanent Select Committee on Intelligence (HPSCI) requested a briefing from the CIA (pp. 135–136). There was a follow-up: a staff member of the committee was dispatched to talk to Dale Graff, at the Foreign Technology Division (FTD), Wright-Patterson Air Force Base.[1] The FTD had contributed some funding, and Graff was involved in overseeing the research.

Congressional interest would persist. For example, Charlie Rose, chairman of the evaluation subcommittee of the HPSCI, became a vocal supporter and repeatedly asked to be kept updated. Later, Claiborne Pell also became a supporter. For years, Pell had a special assistant, C.B. Jones ("Scott Jones"), whose job included keeping an eye on parapsychology. Other friends in high places were Dr. Jack Vorona and Dr. Walter LaBerge. Vorona became aware of the program in 1975, when he was the Deputy Director for Scientific and Technical Intelligence at the Defense Intelligence Agency (DIA). LaBerge became Under Secretary of the Army in 1977. Alexander (2011) has claimed that LaBerge, in the 1980s, had "a strong emotional bias against the program" (p. 36). There is no evidence of this in this volume. However, LaBerge did inquire, more than once, about whether RV had any negative effect on the remote viewers. LaBerge himself once visited SRI International (henceforth SRI) and tried RV, and not without success (Targ, 2008).

In 1977, President Jimmy Carter was briefed by someone from the CIA, who noted that it was not known "whether Soviet capabilities are significantly more advanced" (p. 129). Others were concerned about this possibility, and so Project Gondola Wish came about. The 902d Military Intelligence Group, under the command of the Intelligence and Security Command (INSCOM), came up with the idea that military intelligence personnel could potentially learn to induce out-of-body experiences at the Monroe Institute of Applied Sciences (MIAS), founded by Robert Monroe. However, the MIAS was "not cleared for classified training or information" and the "training could be categorized as experimenting on the human mind" (p. 145); hence, extra approval would have to be sought. Nevertheless, Monroe came to function as a consultant and was granted a SECRET security clearance in 1980 (p. 316).

A new project was initiated in 1978, Project Grill Flame. That year a memo made it clear that: "From the US army standpoint, a strict need-to-caveat is now operative in any situation involving" (p. 139) parapsychology or RV. Vorona, addressing the Department of Defense (DoD) committee on RV activities,

> "... began the meeting with comments about the extreme sensitivity of the subject. Personnel should only be brought in on a strict need-to-know basis ... then discussed the problem of maintaining the security of the remote viewing project. He had decided against establishment of a restricted access list and a special code word for the program, since this would only generate more paperwork, require that more individuals become involved and further risk compromising the sensitive nature of the project" (p. 141).

Late in 1978, Lieutenant Frederick Atwater and Major Murray Watt, on behalf of INSCOM, set out to conduct interviews—they were hoping to find good remote viewers who would come to function as psychic spies for intelligence agencies. Misconceptions have been spread about how the remote viewers were selected. However, this is well-documented by Atwater (2001) and in several declassified documents. Eventually, six persons were chosen, and Atwater started to hold RV sessions with them at Fort Meade. Later, they went to SRI for "technology transfer"—to get their RV abilities assessed.

In 1979, LaBerge suggested that a committee be appointed to review the research and operational applications (p. 173). The committee was headed by Manfred Gale. He attempted to convey the impression that all committee members were unbiased. However, after having given a briefing, Watt noted that many committee members appeared to consider him (i.e. Watt) to be a believer not worth listening to. After committee members had visited SRI, Puthoff felt compelled to send Gale a letter since all visitors didn't seem to have understood important things (pp. 175–176). Gale gave a presentation to the DoD committee on RV:

> "... Gale's briefing was not received favorably ... There were many substantive reservations based on both facts and analysis. The report was, in the view of the group misleading and inadequate, in part because of ambiguity in language" (p. 230).

The Editors have included the entire report (pp. 187–214), here a single excerpt will have to suffice to give the reader an idea of the style and the conclusions:

> "On balance, the Committee has indeed been persuaded that there is some probability that effects attributed to the RV phenomena exist under unexplained circumstances and in conjunction with particular individuals. However, to date, the experimental techniques have not been adequate to document such effects" (p. 188).

Perhaps the most important consequence of the report was that William Perry, Under Secretary of Defense for Research and Engineering, wrote a memo that made it clear that P-6 funds should not be used for RV research (p. 235). The P-6 funds had earlier been an important source of funding. Allegedly, Perry wanted "little to do with the subject" (p. 221), but in the memo, he did not specifically object to the use of operational RV. The remote viewers at Fort Meade had engaged in operational RV since September 1979 and were especially active during the Iran hostage crisis that year (Endersby, 2014). The Joint Chiefs of Staff considered the value of the RV during that period "as being qualitatively equal to those of other intelligence sources available to them" (p. 324).

As part of threat assessment, "SRI accepted a task to evaluate the potential for large-scale training" (p. 277). The involvement of the military also contributed to the need to develop a training program. A result of this was a training procedure, Coordinate Remote Viewing (CRV), which was gradually developed, largely by the psychic Ingo Swann and Puthoff. CRV and the training have been described elsewhere (e.g., Smith, 2005). The Editors have reproduced a project manual, dated 16 December 1985, in which it is stated:

> "The majority of the training sessions for novice trainees are Class C ... During Class C sessions, the interviewer provides the trainee with immediate feedback for each element of data he provides, with the exception that negative feedback is not given" (p. 55).

The main point of contention about CRV concerns this (see May et al., 2015). Naturally, due to the procedure, there was a risk that the trainees actually engaged in a guessing game. The researchers at SRI understood that this was a troublesome possibility. However, there are conflicting claims about this that seem difficult to reconcile. Swann angrily addressed claims about CRV in letters to Mishlove (23 July, 1997) and to McMoneagle (17 November, 1997).[2] In 1980, Swann wanted more time to develop CRV training before he accepted trainees from outside SRI (p. 256). Puthoff, who directed the RV research at SRI, disagreed (p. 247), and there was an urgent need for

funding; hence, trainees from the military were accepted before CRV had been fully developed or evaluated.

In a report from 1982, prepared by the DIA, it is noted that the "effort to date at SRI leaves no doubt" (p. 289) that RV exists, and the authors made it clear that they wanted the RV project to remain active. The RV projects continued to be the subject of congressional interest, but securing funding would remain a recurring problem. However, Richard DeLauer, the new Under Secretary of Defense for Research and Engineering, allowed INSCOM to use P-6 funds again. Formally, Major General Albert Stubblebine, commanding general of INSCOM, acknowledged that Project Grill Flame ended in 1982, but wrote that he had "decided to conduct a similar program" (p. 303). Major General William Odom advised Stubblebine to make it seem as if INSCOM was "engaged in a similar, cooperative effort of its own initiative" (p. 313). Odom described himself as "an honest skeptic" (p. 282). However, Odom was not supportive nor a friend to Stubblebine (see Smith, 2005). The RV project received a new name, Project Center Lane.

It should be noted that RV was just one of several unconventional techniques whose potential use Stubblebine wanted assessed. He was a visionary. Working under Stubblebine was Lieutenant Colonel John Alexander, now known within the parapsychology and ufology community. He has written about some explorations conducted under Stubblebine (Alexander 2017; Alexander et al., 1990). The potential value of training at MIAS was reconsidered. Remote viewers at Fort Meade used "audio tapes which produced enhanced levels of mental concentration" (p. 316). Later remote viewers went to MIAS for training which, according to Atwater, "further developed the ability of project personnel to achieve enhanced levels of concentration, improved their target acquisition, and increased target resolution during operational missions" (p. 316). Atwater (2001), McMoneagle,[3] and Smith (2005) have written about their visits to MIAS.

Lieutenant Colonel Brian Buzby, Project Manager, noted that the RV unit "neither had nor wanted any contact" (p. 319) with Alexander, who was openly interested in parapsychology (e.g., Alexander, 1980). Buzby went on to note that Stubblebine, during a discussion concerning funding, "started to relate some of his experiences and personal thoughts in the field of parapsychology" (p. 319), and would have liked to continue if his schedule had permitted. Stubblebine was not only interested in what was happening at MIAS. He was also fascinated by Cleve Backster's experiments about communication with plants.

Memos indicate that personnel within the NSA were interested in RV (p. 302), but judging by the questions posed, in 1982, the NSA did not have an RV unit at the time. The last request from the NSA for operational RV came in 1984—the CIA also ceased requesting operational RV after 1984 (see p. 6). However, the reasons for this are unclear. The Deputy Director for Operations at the CIA was aware of the "less than hoped for signal-to-noise ratio" yet wanted to continue to task remote viewers when they have "no other recourse and still feel a need to act" (p. 352).

The HPSCI, which had earlier shown interest in RV requested a report in 1982 (p. 300). In a report the following year it was noted that, in the period 1972–1980, "data were highly variable. That is, some good data were mixed with much extraneous or inaccurate information" (p. 330). Later, a request from Congressman Edward Boland made the DIA assemble a team to make an independent evaluation (p. 343). The team noted: "The evidence shown to us is too impressive to dismiss as mere coincidence" and, despite some concerns, concluded that "Dr. Puthoff's team warrants cautious continued fiscal support, and the research should be conducted as much as possible in an open unclassified mode so that its reproducibility and accuracy can be independently verified by others" (pp. 345–346).

In 1984 Stubblebine was replaced by Brigadier General Harry Soyster. Neither he nor Odom wanted to retain the RV project. However, the project was saved by Dr. Jack Vorona and Major General Garrison Rapmund, commander of US Army Medical Research and Development Command—both are singled out for special thanks (see p. 3). As a result of their efforts the project was taken over by the DIA, became known as Dragoon Absorb (briefly), and then Sun Streak.

The National Research Council (NRC) was commissioned to assess techniques meant to enhance human performance. The committee also looked at parapsychology. The Editors cover this in passing (p. 14). It was easy for parapsychologists to argue that the report (Druckman & Swets, 1988) was biased against parapsychology (Palmer et al., 1988/1989). The Contracting Officer's Technical Representative, Dr. George Lawrence's negative stance was already known (Weinberger, 2017). In addition, Prof. Ray Hyman, who chaired the subcommittee on parapsychology, was a Fellow of the Committee for the Scientific

Investigation of Claims of the Paranormal (CSICOP), as was Prof. James Alcock, who wrote the background paper. In the wake of the criticism the Office of Technology Assessment arranged a workshop on parapsychology (pp. 463–472), during which Hyman and Alcock discussed the subject with parapsychologists. A report on the workshop stated:

> "... it is clear that parapsychology faces strong resistance from the scientific establishment ... one way parapsychology might be released from the constrained situation in which it currently operates would be to demonstrate practical applications of psi" (p. 471).

Sun Streak ended in 1990, but lived on in a way when project Star Gate started in 1991: "To monitor and assess select foreign technology developments on a worldwide basis" (p. 504). This was largely thanks to support from Senators. Vorona had left the DIA at the end of 1989, but his successor, John Berbrich, was supportive, judging by his letters after having met Senator William Cohen and Senator John Glenn (pp. 507–509). The efforts of C. Richard D'Amato, on the Senate Appropriations Committee, are more obscure, but his support is said to have been vital (Smith, 1995). In 1993, Dr. Edwin May wrote to him to complain. (May had directed the research since Puthoff left SRI in 1985). May noted that he had been told that some of the research reports that he had sent to the RV unit at Fort Meade had never been read and went on: "We are supposed to contribute to operational applications, but this task has not been exercised by the sponsor" (p. 582).

In 1995, Congress requested that the Star Gate project should be transferred from the DIA to the CIA. D'Amato was unhappy over how the project was treated by the DIA and applied pressure to get the transfer done. The CIA reluctantly accepted the Star Gate project and promptly terminated it. In an email, dated 24 January 1995, someone noted: "The DI is going to take the position that it can't support this effort" (p. 606). DI here refers to the Director of Intelligence, CIA. That email was written long before the controversial final retrospective review had been conducted (i.e. Mumford et al., 1995). The contributions to the report by Hyman (1996) and Utts (1996a, 1996b) have been republished in this Journal (see also May, 1996).

Congress had also stated that "the time has come for a re-evaluation of the classification of the existence of this effort as well as the results" (p. 615). In a memo, dated 21 February 1995, it is noted that the "CIA plans to declassify parts of its program immediately" (p. 615). This eagerness to declassify seems consistent with the decision to not support the effort. However, it is stated that the "CIA would abide by the recommendations" (p. 641) provided from the American Institutes for Research (AIR) review. Originally the review was meant to have been conducted by the NRC. In hindsight, it all seems rushed. The NRC formally declined on 5 May 1995, "the kickoff meeting of the blue ribbon panel" (p. 648) with AIR was held on 25 July, and the AIR study was published 29 September 1995. It seems ambitious to properly review the massive amount of material during such a short time and this was recognized, hence, May was asked to select ten studies. May certainly made Dr. Andrew Kirby, at the CIA, aware of his various concerns (p. 636) but in vain. The AIR report provided the CIA with reasons to end the Star Gate project, which it did.

The fourth and final volume in *The Star Gate Archives* series is a massive paperback. For $95.00 you get: 715 pages, including valuable overviews and good explanations by the Editors, informative appendices, a list of abbreviations, and an index. The Editors have reproduced "the most important and relevant memorandums and reports (a balance of support for the program or not)" (p. 11). Mayer (2008) suggested that the declassified documents from the projects constitute "a gold mine for scientific exploration of possibly anomalous cognition" (p. 128). Unfortunately, it is not always easy to see the gold. The Editors note: "The CIA declassified about 11067 documents, covering the period 1972 to 1995 ..." (p. 10). McMoneagle's assessment, in 2004, was perhaps overly harsh: "... it's been thoroughly picked through and there is nothing of material value ..." (Vallee, 2023, p. 472). However, much of the paperwork did not strike me as particularly interesting and there is overlap between documents. The Editors also wish to provide evidence for operational RV, but this appear overly ambitious and their efforts are not entirely successful. They only provide brief summaries (pp. 34–45), though project numbers are given so the reader can follow-up. However, the massive volume provides a glimpse behind the scenes and should be of value to historians. Dr. Harold Puthoff once summarized:

> "The evidence is in—solidly in. But our ability to rely on remote viewing as an intelligence tool isn't ready for prime-time TV and that's a very real problem. We don't know enough. The results produced by remote viewing have

been truly impressive but they're inconsistent, unpredictable, and we know very little about who's good at it or why" (Mayer, 2008, p. 128).

ENDNOTES

1 CIA-RDP96-00788R001100030001-6.
2 Available at the Special Collections, Ingram Library, University of West Georgia.
3 CIA-RDP96-00788R001700210017-4.

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Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK AND MULTIMEDIA REVIEW

Ben Jonson's Unorthodox Poetics: Rhetoric, Proportion & Authorship

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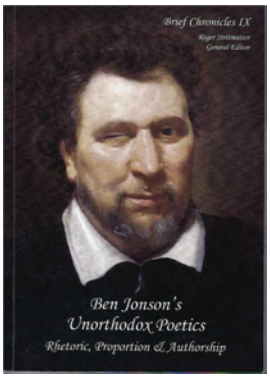

Roger Stritmatter, ed.

Ben Jonson's unorthodox poetics: Rhetoric, proportion & authorship. Published by the Shakespeare Oxford Fellowship, 2025. 236 pp.

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In the history of the Shakespeare authorship controversy – whether the name Shakespeare could have been a pseudonym — the role of "honest Ben" Jonson remains a central paradox. Perhaps he was just a satirist turned eulogist in the First Folio and the editorial mastermind behind the legacy of an unlettered businessman from Stratford-upon-Avon. Or perhaps Jonson was instead a cryptographic game-player hiding in plain sight and a social revolutionary defending aristocratic privilege?

Whether Shakespeare heretics are right — and one or more concealed authors are indeed hiding behind the "Shakespeare" byline — or whether they're wrong, Jonson himself remains an enigma for the ages. That is probably the reason why Oxfordian scholars – those doubters — who believe that Edward de Vere, the 17th Earl of Oxford was the real mastermind behind the works — have tended to shy away from the Jonson question, preferring instead to train their focus on the Bard himself. Or herself.

This recent collection of twelve essays edited by the pre-eminent Oxfordian scholar Roger Stritmatter begins to correct the record, however. The ninth in the Shakespeare Oxford Fellowship's "Brief Chronicles" series, the 2025 edition examines Jonson's role in the Shakespeare First Folio as well as in the emergence of a Shakespeare mythology perpetuated in the 17th century and surviving down to today.

With this volume, the reader discovers a remarkable alternative intellectual ecosystem that has evolved over the last century of quiet, heterodox Jonson scholarship. Collectively, the works compiled in the volume (albeit at times shoddily proof-read and bearing an unfortunate, unwieldy title) present not merely alternative interpretations of Jonson's familiar texts, but rather a comprehensive reimagining of one of English literature's most foundational narratives.

THE META-ARGUMENT: JONSON AS MASTER ARCHITECT

The thesis binding these essays positions Ben Jonson not as Shakespeare's honest contemporary witness, but as the primary architect of what (if the heretics are correct) may be literary history's most successful deception. From George Greenwood's pioneering 1921 analysis to Roger Stritmatter's recent cipher work, the essays themselves construct a portrait of Jonson as a kind of sophisticated literary agent who orchestrated the Stratfordian attribution through multiple interconnected strategies: satirical attacks on the man from Stratford (Ruth Loyd Miller's deep dive into Jonson's dramatic character Sogliardo); editorial control of the First Folio (Gerard Rendall's meta-analysis of the Folio project), cryptographic embedding of the true author's identity (Stritmatter's essay on "witty numbers"); and memorialization of the Stratford story through monument inscriptions (Nina Green's linguistic analysis of the Stratford monument).

In all, the reader finds that the Shakespeare attribution was a carefully planned project executed by someone intimately familiar with court politics, publishing practices, and the social constraints governing aristocratic authorship. The essays collectively argue that Jonson possessed both the literary skill and institutional position necessary to construct and maintain such an elaborate fiction.

METHODOLOGICAL CONTRASTS AND SCHOLARLY EVOLUTION

In terms of authorship studies, the essays reveal stark contrasts in methodological approach over the last century. Early British scholars like Greenwood and Rendall used primarily historical and biographical analysis, focusing on documentary evidence and social context. Greenwood's work emphasizes the legal and social impossibility of Jonson's official testimony, while Rendall concentrates on family connections and publication chronology.

Modern scholars like the American Stritmatter and the late British writer Alexander Waugh have introduced sophisticated textual analysis techniques, including cryptographic analysis and computational linguistics. Stritmatter's "Cardano Grille" analysis of Jonson's "To the Reader" in the Folio represents a methodological leap from earlier work, suggesting that Renaissance authors embedded multiple layers of meaning through mathematical precision rather than literary allusion alone.

Canadian scholar Gabriel Ready's institutional analysis represents yet another methodological approach, examining how modern academic structures influence scholarly interpretation. Ready's "two tribes" framework suggests that methodological differences may be less significant than institutional pressures that shape scholarly conclusions.

Several significant contradictions emerge within this scholarly tradition. The most fundamental concerns Jonson's motivation and emotional state. American director Ted Story's essay emphasizes Jonson's humor and satirical pleasure in the deception and contrasts sharply with Greenwood's portrayal of Jonson as a writer constrained by social necessity and possibly conflicted about his role. Story's "Ben Jonson Made Me Laugh" suggests active enjoyment in the literary game, while Greenwood presents Jonson as operating under compulsion.

Similarly, the essays disagree about the scope of Jonson's knowledge and involvement. Canadian researcher Nina Green's essay suggests Jonson controlled even peripheral elements like the Stratford monument inscription, implying comprehensive management of the Shakespeare mythology. However, Waugh's "Sweet Swan of Avon" analysis suggests more limited involvement, focusing primarily on First Folio contributions.

Despite such methodological contradictions, the essays do demonstrate remarkable coherence around several core propositions. They consistently argue that orthodox interpretation of Jonson's testimony relies on selective reading that ignores contradictory evidence within Jonson's broader corpus. They agree that the First Folio represents a publishing project fundamentally different from normal early modern practice, requiring explanation beyond conventional literary history.

The collection's greatest strength lies in its cumulative effect. Individual arguments that might seem speculative gain credibility when multiple independent analyses point toward similar conclusions using different methodologies. Stritmatter's cryptographic analysis independently corroborates Rendall's historical documentation of Jonson's editorial control, while Green's linguistic analysis supports Greenwood's thesis about coordinated deception.

However, the collection's coherence does suffer somewhat from its reliance on negative evidence — demonstrating problems with orthodox interpretation rather than providing definitive proof of alternatives. The essays excel at revealing inconsistencies in traditional scholarship but struggle to establish positive proof of their own counter-narratives.

UNEXPECTED IMPLICATIONS AND UNINTENDED CONSEQUENCES

Perhaps the most striking unintended consequence of this scholarship is its implicit challenge to the nature of authorship itself. By demonstrating the sophisticated collaborative networks surrounding Renaissance publication, these essays inadvertently undermine the idea of individual authorship as a meaningful category. Ready's analysis of Cambridge University's more recent chronological revelations suggests that even clearly attributed works like Jonson's involve complex collaborative processes that resist simple attribution.

The essays also reveal the extraordinary sophistication of Renaissance literary culture. Stritmatter's cipher work implies that educated readers were expected to decode multiple layers of meaning, suggesting intellectual standards that challenge modern assumptions about historical literacy and textual consumption.

Paradoxically, the collection's detailed analysis of literary deception provides a template for understanding how textual authority is constructed and maintained across historical periods. The mechanisms Jonson allegedly used to establish Shakespeare's authorship — editorial control, strategic collaboration, institutional endorsement – surely mirror those used by modern academic institutions to maintain scholarly orthodoxy.

For modern readers, this collection of Jonsonian essays suggests that the relationship between Jonson and the Shakespeare project represents an impressive case study in how literary reputation can be manufactured and sustained across centuries. The sophisticated techniques allegedly employed — from cryptographic embedding to institutional coordination – seem to prefigure modern concerns about textual authenticity in digital environments.

The volume's challenge to orthodox scholarship certainly parallels contemporary debates about institutional authority across multiple disciplines. Ready's analysis of *academic avoidance* strategies resonates with broader discussions about how professional structures shape scholarly conclusions. The essays' demonstration that conventional wisdom can persist despite contradictory evidence certainly speaks to current concerns about institutional inertia and confirmation bias.

The most profound contradiction between these essays and prevailing scholarly belief concerns the nature of evidence itself. Orthodox Shakespeare scholarship treats the absence of contemporary contradiction as evidence for authenticity, while these essays treat the same absence as evidence of a successful deception. This epistemological divide suggests fundamental disagreement about how historical truth is established and maintained.

Interestingly, current trends in digital humanities and computational analysis may provide new tools for resolving these disputes. The kind of systematic textual analysis Stritmatter uses could be scaled across entire corpora, potentially revealing patterns invisible to traditional literary analysis. Similarly, network analysis of Renaissance social and publishing connections might well illuminate the collaborative structures these essays describe.

CONCLUSION: THE ARCHITECTURE OF LITERARY TRUTH

These twelve essays collectively argue that Ben Jonson was not merely Shakespeare's contemporary but the master architect of Shakespeare's literary immortality. Whether through conscious deception or unconscious collaboration, Jonson emerges as the figure most responsible for the textual and institutional structures that have sustained the traditional Shakespeare attribution for four centuries.

The collection's most profound contribution may therefore be its demonstration that literary authority depends not on intrinsic textual properties but on the sophisticated coordination of multiple cultural institutions — editorial, academic, commemorative, and critical. In revealing the mechanisms allegedly used to construct the Stratfordian authorship, these essays provide a blueprint for understanding how literary truth is manufactured, distributed, and preserved across historical periods.

The ultimate meta-question these essays pose is not so much whether Shakespeare was someone else, but rather whether authorship itself means what we think it means. In pursuing the former question, Stritmatter and the collection's authors have inadvertently illuminated the latter. And in doing so, they have provided tools for understanding literary authority that extend far beyond Renaissance England into the digital age and beyond.

ENDNOTE

1 Allison Richards is an independent scholar and longtime Shakespeare researcher who resides in Massachusetts. She did a previous book review for *JSE* in in the special issue on the Shakespeare Authorship Question (Summer 2023, volume 37, issue 2). Readers are asked to note that the name Allison Richards is a pseudonym being used with the express knowledge and permission of the journal to protect the author's professional status and well-being.

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Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK AND MULTIMEDIA REVIEW

Forbidden Science 6: Scattered Castles, the Journals of Jacques Vallee, 2010–2019

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Jacques Vallee

Forbidden science 6: Scattered castles, the journals of Jacques Vallée, 2010–2019. Documatica Research.

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Those who have been following Jacques Vallée's ongoing set of memoirs under the series title of "Forbidden Science" (Vallée, 1992, 2009, 2012, 2019, 2023) will welcome this sixth installment covering the years 2010 through 2019—representing the sixth decade of his research and reminiscences on UFOs, as well as his professional career as an astronomer, computer scientist, and venture capitalist.

As in the previous volumes, the book is presented as a narrative diary, essentially written at the time of the events described—although Vallée has hinted that the chronicle has been enhanced from "copybooks, loose pages, letters, and marginal notes" (Vallée, 1992: vii) and "notes and transcripts and bits of correspondence, or notices of events that brought back smiles or tears" (Vallée, 2023: 8).

The subtitle, Scattered Castles, is based on the name of a personnel security database used by the US intelligence community that logged Vallée's personal info on his visit to the National Reconnaissance Office in Chantilly, Virginia, in 2010 (p. 19). Metaphorically, it could also represent his accomplishments as an architect of various enterprises, from artificial intelligence to healthcare startups or the interdimensional hypothesis for UFOs.

Forbidden Science 6 covers some major events in Vallée's life (mourning the loss of his first wife Janine, his second marriage to Flamine, a research trip to Brazil, and conferences in Russia and Argentina) and the history of ufology (the end of the US Defense Intelligence Agency's Advanced Aerospace Weapon System Applications Program (AAWSAP), later meetings with colleagues who had been associated with the group, and the resurgence of interest in UFOs after the *New York Times* revealed the existence of that program in 2017). As always, Vallée maintains an engaging narrative, spicing the story up with specifics of meals eaten, concerts heard, and conversations remembered, often embellished with a Gallic swathe of colorful weather reports worthy of Monet—"the weather a succulent blend of morning moisture and blue-sky spring" (p. 114). He also parenthetically mentions political and world events (the fire at Notre-Dame de Paris, p. 486) that are both useful for the timeline and allow him to wax philosophical with lofty observations on the state of humanity or "lamenting the shallowness of modern spiritual movements" (p. 482).

Like other journals and diaries, the details are in the moment, so you will have to look elsewhere in Vallée's oeuvre for detailed documentation of UFO cases or a statistical analysis of sighting patterns. But his long history of involvement in the topic, combined with his many interactions with prominent ufologists and scientists interested in paranormal phenomena, make this and the other volumes in the series a treasure trove of enlightening trivia. No other UFO autobiography, few as they are, comes close in scope and vitality to Forbidden Science.

Although Vallée makes repeated references to his wanting to maintain some distance from the acrimonious debates ufologists often engage in (Vallée, 2019: 8) and the "heavy bias of politics, greed, and religion even in the great halls of science" (p. 8), this does not stop him from clearly stating his often harsh opinions. He offers these observations honestly and seemingly spontaneously, thus making them important benchmarks in the evolution of his outlook.

Readers have two choices in making use of *Forbidden Science 6:* They can read it in sequence from start to finish; or they can dip into it at various points, harvesting data of interest from specific dates, places, or personalities. Each method has its own rewards and challenges.

A straightforward chronological reading makes the most sense if you have done the same with Vallée's previous volumes, because you will already be familiar with the names of his friends, family, and associates, many of whom he refers to in key areas only by first name. (Who is "Annick" on p. 30? Unless you know, you have to do some creative searching to discover her full name is Annick Jeane Thoby Saley, at least according to the index.) With the other books on hand, you will have access to the continuity of narrative and backstory required to make some sense of his journal entries. Even if you have not benefited from the earlier history, a front-to-back reading of volume 6 on its own will be rewarding, especially if you are willing to constantly check Wikipedia and Google to clarify the wall-to-wall name dropping that takes place—for example, the reference to "Kelsey Graves' old study of the role of 'Saviours' in civilization" (p. 198).

Selective consultation is not as productive as it could be, for one primary reason: The two indexes (name and subject) both have serious flaws in both comprehensiveness and accuracy. I do not know if the other volumes have the same issues, but in volume six the printed name index has many false hits and omissions and the subject index has many gaps in coverage.

One major anomaly is that there is no index entry at all for Vallée's partner and second wife, Flamine de Bonvoisin, who is mentioned on many pages, from his first meeting with her in 2010 (p. 13) through his marriage proposal (p. 90) and her father's death (p. 305), to their separation (pp. 335, 397) and their unresolved relationship in 2018 (p. 463).

Similarly, there is no index entry for Michel "C" in the index, either under Michel or "C," even though he appears in a photograph on p. 34; other entries accommodate anonymous individuals, such as "Ann" or "Identity Woman" or "Roro." In another example, the first six pages in the name index entry for Jean-François Boëdec are inaccurate, while his first real mention on page 33 is missing. There are enough of these gaps scattered around so that you will probably not be comprehensive in your search for pages mentioning, for example, Gerry Nolan, if you limit your search to the printed index.

The subject index appears to have been prepared either haphazardly or half-heartedly. So many major topics are missing that its utility is questionable. References to Vallée's famous theory of a "control system," for example, could have been included (pp. 94, 159, 499), as well as his financial investments, such as RosAtom or Novalem Analytics (although there are entries for "venture capital" and "venture fund"). His musings on the "extraterrestrial hypothesis" are either missing or buried in a generic entry for "extraterrestrial." On October 27, 2018, Vallée describes (p. 471) a vivid psychic experience he had at his home in San Francisco; this appears to be referenced in an entry for "out-of-body experiences (OBE)," but the index misses his later reference to the "unique feeling of terror" that it inspired (pp. 483–484). His references to alleged physical evidence, including his first look into the 1945 Trinity case, are buried in the entries for "crashes (UFOs)" and "samples—material." The prominent 2004 "Tic Tac" UFO case involving the USS *Nimitz* has no entry of its own.

Some organizations (CIA, CNES, DIA, FBI, MUFON, NASA) are included as acronyms, but others that are mentioned in the narrative are missing, such as NARCAP, To the Stars Academy, and the Center for UFO Studies (CUFOS)—which is mentioned at least on pp. 150 and 166.

All of these problems with the printed index lead me to conclude that a wiser choice would be to select the Kindle edition of the book, which at least has full-text searching.

Vallée and the editors have made the decision to provide only limited context for much of the material in this possibly final volume, confining it to ten pages of explanatory references (pp. 520–529). But perhaps the final job of annotating all of Forbidden Science can best be completed by future Vallée scholars who will have access to the vast archive of his papers now residing at Rice University's Fondren Library in Houston, Texas.

Other paranormal topics that have occupied Vallée's interest are threaded throughout these books, pushing them far beyond the UFO category—alchemy, remote viewing, Rosicrucianism, even Rennes-le-Château. The breadth of the journey that Vallée has taken in life means that even a casual dip into these pages will result in multiple insights, many of them unexpected, from a talented scholar who is also a master memoirist.

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Journal of Scientific Exploration
Anomalistics and Frontier Science

OBITUARY

Stephen E. Braude, Jazz Philosopher and Parapsychologist, 1945–2026

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Our extraordinary colleague and friend, Steve Braude is gone, passing from this world on January 3, 2026. Our community of psi-interested people lost a wonderful example of the curiosity and rigorous thinking that defines us at our best. Steve was a professional philosopher but his wide ranging intelligence informed him deeply in many fields of intellectual relevance to the study of psi and anomalies. As a result, his books, papers, and essays became go-to classics for researchers in our field looking for theoretical and practical perspectives on the remarkable phenomena and data we explore.

Stephen was born April 17, 1945, in Las Vegas, Nevada. He studied Philosophy and English at Oberlin College and the University of London, and in 1971 he received his Ph.D. in Philosophy from the University of Massachusetts at Amherst. He was Professor of Philosophy at the University of Maryland, where he spent much of his career. When he retired he and his wife Gina (who he said proved that miracles exist) moved to Las Vegas, returning to his birthplace. With his quirky sense of humor, I imagine he'd say he "returned to the scene of the crime."

He was both quiet and gregarious, and counted many in the psi research community as good friends, all admirers of his breadth of interests. He was a professional jazz musician, composing and performing solo and with the Yamara Band. He played cool, smooth jazz we can enjoy in many recordings, including videos that present the music with extraordinarily beautiful landscapes and backgrounds. Steve was always adventurous. I first encountered him at a post-conference evening gathering while he was playing a wire oven shelf – somehow drawing charming musical sounds from what should be clunky at best. He's the only person I know who had a pet pig – named Hamlet, of course. He summed up his way of looking at life in a tongue-in-cheek email signature: "If you never try anything new, you'll miss out on many of life's great disappointments."

Steve was also an accomplished photographer, and created a prize-winning collection of 3-D photographs that delight the eye and mystify the mind. He loved great music, and in each of his homes he created a listening room that sought perfection of presentation. I was fascinated to learn how deep one can go in that pursuit when Steve showed me the CD planing device he used to make the recording surface as nearly ideal as could be achieved. I think it's fair to say he was a perfectionist, remarking in one of his ironic persona descriptions that he was an "Audio Tweakmaster Dedicated to Falling Short of Perfection."

He was a past president of the Parapsychological Association, and was Editor-in-Chief of the Journal of Scientific Exploration for 13 years. He published seven books, mostly addressing issues in psi research and theory, and over 100 articles in a range of

philosophical journals. His book titles are a testament to his unusual creative mind, including "Crimes of Reason: On Mind, Nature, and the Paranormal" and "First Person Plural: Multiple Personality and the Philosophy of Mind."

Steve Braude was a tough minded, deeply insightful contributor to Philosophy and Parapsychology. He wielded a sharp and lucid logic in all his contributions and we will miss that voice. He was also a warm and funny character who became a dear friend to many of us in the consciousness research community. He will not be forgotten, and through his writings and his many interviews will continue to contribute his clear thinking to our work. A deeper and more comprehensive look at Professor Braude's many-sided persona can be enjoyed at his personal website, https://www.jazzphilosopher.com/ Make some time to enjoy a picture made by Steve himself.

Dear friend, we will miss you. Rest in Peace.

Journal of Scientific Exploration
Anomalistics and Frontier Science

CORRECTION

Corrigendum for "Effects of Global Consciousness on New Years Eve: A Study in Experimental Metaphysics"

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In an analysis reported in Radin (2025), which explored how data from the Global Consciousness Project behaved during multiple New Years Eve celebrations, I cited a principal component analysis (PCA) composite score at the stroke of midnight as $z \approx -4.9$ ($p < 3 \times 10^{-7}$). That statistic implicitly assumed that the normalized composite score followed a standard normal distribution with independent measures. However, thanks to the sharp eyes of two *JSE* readers, I realized that this interpretation was incorrect because the five constituent metrics (correlation dimension, permutation entropy, Higuchi fractal dimension, BDS statistic, and autocorrelation) were mutually inter-correlated. As a result, the first principal component, a weighted linear combination of these *z*-scored metrics, had an inflated variance relative to a standard normal distribution.

To obtain a valid probability estimate, I conducted a parametric bootstrap test with 100,000 iterations. In each iteration, a new dataset of 100 30-second segments of GCP data × 5 metrics was generated by sampling from a multivariate normal distribution with the observed correlation matrix, and then PCA was computed. Repeated iterations built an empirical null distribution that correctly accounted for the dependency structure among the five metrics, which had a standard deviation of approximately 1.67 instead of 1.00, confirming the variance inflation.

Given the directional hypothesis predicting decreased complexity at midnight, the corrected one-tailed *p*-value for the midnight composite score was $p = 0.0013$, corresponding to an equivalent *z*-score of −2.97. While this is not a significant as originally reported, the stroke of midnight remained the most statistically significant of all 100 time points tested, and when evaluated near the hypothesized stroke of midnight (±5 30-second segments), it survived a Bonferroni correction for multiple comparisons (threshold $p < 0.0045$).

It is worth noting that the PCA composite score aggregated five correlated but *conceptually distinct* measures of order. While their inter-correlations necessitated the bootstrap correction described here, that metrics designed to detect different aspects of temporal structure all deviated coherently at the predicted time supports the conclusion that something about that moment in time was unusual. I thank Dick Bierman and Hartmut Grote for their comments.

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15th SYMPOSIUM OF BIAL FOUNDATION

BEHIND AND BEYOND THE BRAIN

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The Foundation also promotes two research funding programmes. Since 1994, a Grants Programme for Scientific Research, focusing on Psychophysiology and Parapsychology as research areas. To date, the Bial Foundation has approved 946 projects involving nearly 1,900 researchers from 31 countries, resulting in the publication of 2,232 articles in indexed journals (Scopus or Web of Science). Of these, 1,948 were published in journals with an average impact factor of 4.1, and 394 in journals with an impact factor equal to or greater than 5. By September 2025, the total number of citations had reached 59,997, with 758 publications cited more than 20 times. Since 2022, and in collaboration with ICBAS, the Foundation also manages the Nuno Grande Doctoral Scholarships, which support research in Fundamental Health Sciences carried out by medical PhD students at Portuguese universities.

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Primary research or interesting and important theoretical papers that foster the diversity and debate inherent to the scientific process. This entails novel or innovative ideas that have some 'fragmentary' experimental or empirical support but which can be evaluated with logic and open-mindedness to present academia with provocative hypotheses that would otherwise be rejected by most conventional journals.

1. All empirical results that have not been replicated should be called 'preliminary' with the findings treated as such. Peer-review and publication priority will be given to studies that are (a) pre-registered or (b) replications. Note that 'replication' can involve repeating the research procedure in a (nearly) identical separate study to be reported within the same paper (e.g., 'Study 2: Replication'). Or, large datasets can be divided randomly into 'Training' and 'Test (or Validation)' sets, i.e., the research findings presented are those results that replicated in the Test set.

2. To promote stricter transparency and context for readers, all analyses where appropriate should provide effect size statistics in the form of direct percentages of either association (correlative analysis) or mean percentage differences (ANOVA, t-tests, etc.). In the case of correlative analysis, reported results shall report R2 to provide a covariance percentage estimate. Mean tests shall provide a 'percentage change' indicating the actual percentage change between groups (e.g., M = 3.44 Group 1 versus M = 4.02, in Group 2, on a five-point scale is calculated by the following: ABS $[M_1 - M_{2/5}$ (scale range)] = 11.6% shift or change in means). Standard effect statistics also are allowed, so long as the above percentage techniques are likewise reported. These statistics should be reported in results as 'percentage effect' and follow immediately after standard statistical analysis notation. For correlation, ($r = .43$, $p < .01$, percentage effect = 18%), for means tests ($M_1 = 3.44$ versus $M_2 = 4.02$, $t = 3.443$, $p < .01$, percentage effect = 11.6%).

B. SYSTEMATIC, NARRATIVE, AND SCOPING REVIEWS (~12K WORDS MAX)

All meta-analyses and systematic reviews should include a PRISMA flow diagram to clarify for readers how the exclusion/inclusion criteria were applied to create the literature set under consideration: See http://www.prisma-statement.org/.

C. BRIEF REPORTS—RAPID PUBLICATIONS (~2K WORDS MAX)

These are usually pilot studies, direct or conceptual replication attempts of previous work, case studies, brief evaluations, reviews, or 'citizen scientist' efforts that are unique, first-time reports, with no more than two tables and/or figures and 10 references. This rapid publication option is especially appropriate for graduate-level student studies, pilot or preliminary research, or descriptions of important new methods or instrumentation. These reports are subject to blinded peer review in the same manner as research articles. Authors should follow all requirements for longer manuscripts when submitting Brief Reports, including that they have not been submitted or published elsewhere.

D. BOOK AND MULTIMEDIA REVIEWS (~2K WORDS MAX)

Structured for readability and utility in which the content is suitably contextualized and includes links to general model-building or theory-formation in the respective domain(s). Please use the following headers or otherwise incorporate these themes into the review: (a) Author Disclosures; (b) Content Overview; (c) Pros, Cons, and the Book's Contributions to the Literature; (d) Recommendation; and (e) References (if applicable). For an example, see: https://www.spr.ac.uk/book-review/poltergeist-night-side-physics-keith-linder.

Multimedia reviews can cover films, documentaries, recorded presentations or symposia, video series and reports, websites that are comprehensive resources, software for scholars, and even peer-reviewed articles in other journals that are pertinent to frontier science. Submissions are now being accepted, and authors should note that these multimedia reviews should include four components: (a) Introduction; (b) Summary of the Media Content; (c) Description of the Value of the Media to the Journal's Readership; and (d) Critique of the Media. These components need not constitute major sections, but each issue should be clearly addressed in the submission. We strongly encourage prospective authors to discuss their topic for a multimedia review with the subsection Editor Mel Larrosa prior to submission: mel.larrosa@yahoo.com

E. ESSAYS (~8K WORDS MAX)

Important conceptual or philosophical commentaries, observations, or arguments to spark constructive discussion or debate relative to theory, methodology, or practice.

F. LETTERS (~1K WORDS MAX)

Must address substantive issues relative to recently published content in the Journal.

SUBMISSIONS (A) TO (C), and (E) AS APPROPRIATE, MUST ALSO INCLUDE THE FOLLOWING INFORMATION:

1. **Author affiliation.** Please provide ORCID numbers for authors as available.
2. **Abstract (~150 words max).** JSE uses an unstructured format for summaries and encourages language accessible to readers across different disciplines.
3. **Implications and Applications (~150 words max).** Placed immediately after the Discussion section to succinctly summarize or suggest how the study's methods or findings can potentially inform the study of other issues, anomalies, or fields of study, including interdisciplinary and multidisciplinary approaches.
4. **Data-sharing requirements.** Primary (raw) data (redacted for confidential or personally-identifying information) must either be (a) uploaded to a freely accessible repository for independent verification or analysis by qualified researchers and the URLs shared in the paper and in a section called Data Availability under the Acknowledgments section (the Journal can provide such space), or (b) otherwise provided to qualified researchers on formal request.
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