

Electric Selves: Bioelectricity, the Law, and the Limits of Consciousness

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ABSTRACT

This literature review examines how legal and clinical standards of personhood, responsibility, and truth have come to rely on electrical activity in the brain as a proxy for consciousness, even as neuroscience and philosophy reveal the limits of that proxy. Drawing on Benjamin Libet's readiness-potential experiments, the review first asks whether unconscious neural preparation undermines the legal assumption of conscious, deliberate choice that underlies criminal responsibility, and surveys how courts such as *Roper v. Simmons* have weighed neuroscience evidence against existing behavioral and developmental research. It then turns to legal definitions of personhood at the boundaries of life and consciousness: the electrical criteria used to declare brain death, the divided awareness revealed by Gazzaniga's split-brain research, and the paradox of locked-in syndrome, in which full consciousness survives behind total paralysis and is recognized only when it can be technologically demonstrated. The review further considers brain-based lie detection, contrasting the courts' rejection of fMRI evidence in *United States v. Semrau* with the narrower admission of EEG-based "brain fingerprinting" in *Harrington v. State*, to show how the Daubert standard mediates the law's uneasy relationship with reading the brain directly. Finally, the review situates these findings against David Chalmers' "hard problem" of consciousness, arguing that every legal and clinical standard examined treats electrical activity as a proxy for awareness precisely because awareness itself resists direct observation. Framed throughout by Mary Shelley's *Frankenstein*, the review concludes that law and science may be permanently limited to reading the trace of consciousness rather than consciousness itself, and that this limitation is best understood not as a temporary technological gap but as a structural feature of how electrical evidence relates to legal and moral responsibility.

INTRODUCTION

This paper examines a specific interdisciplinary problem: how far legal and clinical judgments about responsibility, personhood, and truth can legitimately rely on measurable electrical or neural activity as evidence of consciousness. It focuses on the tension between what neuroscience can observe and what law and philosophy must infer. Rather than treating brain activity as equivalent to consciousness, the paper asks what happens when electrical evidence is used to stand in for an inner state that cannot be directly observed.

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The central research question is: To what extent can electrical activity in the brain serve as a reliable proxy for consciousness in legal and clinical decision-making, and what limits does that proxy impose on judgments about responsibility, personhood, and truth? The discussion brings together neuroscience, legal doctrine, and philosophy to examine this question through several contrasting cases and debates, while using Mary Shelley's *Frankenstein* as a recurring humanistic frame.

METHODOLOGY

This paper uses a qualitative literature-review approach. Sources were selected for their direct relevance to the central research question and for their ability to represent the different ways electrical or neural evidence enters legal and clinical reasoning. The review draws on Libet's readiness-potential experiments, legal and developmental scholarship surrounding *Roper v. Simmons*, the Uniform Determination of Death Act, split-brain research associated with Sperry and Gazzaniga, legal scholarship on locked-in syndrome, *United States v. Semrau*, *Harrington v. State*, and Chalmers' philosophical account of consciousness. These cases and sources were chosen because, taken together, they illustrate distinct problems of inference: predicting intention, defining death, recognizing consciousness, and treating brain activity as evidence of truth. The review is interpretive rather than an exhaustive systematic review, and its conclusions are therefore limited by the scope and evidentiary base of the literature considered.

FROM NEURONS TO AWARENESS

If thought itself is associated with electrical activity, and some decisions can be preceded by neural activity that participants report becoming consciously aware of only later, then questions arise about how conscious intention relates to legal responsibility. The evidence, however, must be interpreted cautiously: Libet's experiments concerned simple voluntary motor actions, not the complex, deliberative decisions that commonly arise in criminal law.

Drawing on Benjamin Libet's landmark 1983 experiment, the readiness potential — unconscious brain activity preparing for movement — was found to precede a person's reported moment of conscious intention to act. In trials with no preplanning (Type II RPs), this unconscious activity began roughly 350 milliseconds before conscious awareness; in trials where participants reported some degree of preplanning (Type I RPs), the gap widened to nearly 800 milliseconds. This consistent lag between unconscious neural preparation and conscious awareness has been used to argue that what we experience as a 'free' decision may actually follow, rather than cause, the brain's initiation of action — though Libet himself maintained that consciousness retains a brief 'veto window,' roughly 100–150 milliseconds, in which an initiated act could still be consciously stopped.

If the brain's preparation for a simple action precedes a person's reported awareness of deciding to act, this raises an uncomfortable question for criminal law, which has long rested on the assumption that punishable acts involve a deliberate, conscious choice. Criminal law has traditionally rested on the idea of *mens rea* — a guilty, deliberate mind behind an act — but Libet-style findings should not be treated as direct evidence that complex criminal decisions are unconsciously determined. Rather, they complicate the broader relationship between neural preparation, conscious intention, and moral blame.

While neuroscience evidence was submitted to the Court in *Roper v. Simmons* (2005), the majority's decision to limit juvenile sentencing relied primarily on psychological and developmental research — illustrating that brain science currently supports, rather than independently drives, legal reasoning about culpability. Scholars disagree on how much weight this evidence actually carried. Rebecca Dresser argues that scientific evidence shapes legal responsibility mainly when it aligns with judges' existing intuitions — meaning *Roper* reflects science reinforcing an established legal instinct rather than independently deciding the outcome. Laurence Steinberg, who helped author the APA's amicus brief, took a different view, arguing the neuroscience offered valuable confirmation of the behavioral research, since adolescent brain changes corresponded with known behavioral patterns.

If the law itself is uncertain how much weight to give the brain evidence, can justice ever be entirely free of biology — or entirely independent of it?

ELECTRICAL PERSONHOOD: WHERE LAW MEETS THE SELF

If awareness itself is an electrical phenomenon, the question of when a 'person' legally begins or ends can no longer be separated from the question of when the brain's electrical activity begins or ends.

Just as Galvani's experiments suggested that electricity could stimulate biological activity, modern law and medicine have developed neurological criteria for determining death. Under the Uniform Determination of Death Act (1981), death may be determined by irreversible cessation of all functions of the entire brain, including the brain stem. The standard provides healthcare professionals with a framework for navigating the pathophysiological, legal, and ethical dimensions of determining death.

If brain death shows the law treating electrical activity as the line between life and death, split-brain research complicates the picture further — suggesting that even within one living, legally singular person, consciousness itself may not be as unified as the law assumes.

Decades of research by Sperry, Gazzaniga, and their colleagues on a relatively small group of split-brain patients have produced a detailed functional picture of how each hemisphere operates — though the nuances, exceptions, and inconsistencies across different testing conditions show just how complex and incomplete that picture still is. Notably, the extent of surgery varied between patients: some underwent a full severing of the corpus callosum (the brain's largest commissure, connecting the two hemispheres), while others had only a partial cut — meaning the degree of hemispheric independence observed could vary from case to case.

In one of Gazzaniga's classic experiments, split-brain patients were shown two different images simultaneously — one to each half of their visual field, which routes to opposite hemispheres. When an image was flashed to the left visual field (processed by the right hemisphere), patients could not verbally name what they saw, since the right hemisphere lacks the same language capacities as the left; yet when asked to identify the matching object using their left hand, they could correctly select it, despite verbally reporting that they had 'seen nothing.' The experiment provided evidence of dissociation between information available to one hemisphere and information available for verbal report, but it does not by itself establish that two fully independent conscious persons occupy one brain.

It is worth noting how narrow the evidentiary base for this entire field actually is: fewer than 100 split-brain patients have been studied in depth worldwide, since corpus callosotomy surgery became far less common after the development of more effective epilepsy medications. This makes split-brain research a striking case of far-reaching philosophical and legal implications built on a remarkably small clinical sample.

A second, more philosophical way of describing split-brain patients asks what subjective experience is actually like for them — what it 'feels like' to live with a divided brain. This question has captured public imagination because it raises the possibility that hemispheres may support partly independent streams of processing. However, the subjective experience of split-brain patients cannot be inferred directly from experimental performance, and findings vary across patients and testing conditions.

If a single brain can, under some experimental conditions, exhibit partly independent streams of information processing and awareness, the law's working assumption of one person, one mind, and one set of intentions can be understood less as a settled scientific fact than as a practical legal simplification.

Split-brain cases raise doubts about whether one consciousness truly lives behind one face — locked-in syndrome raises the opposite problem: a fully unified, fully aware consciousness trapped behind a face that shows nothing at all.

A patient with locked-in syndrome experiences near-total paralysis of the entire body, retaining only minute movements of the eyes and eyelids — while consciousness and awareness remain fully intact behind that paralysis. The pons houses the primary motor pathways (corticospinal and corticobulbar tracts), which are destroyed in locked-in syndrome, causing quadriplegia and mutism. However, consciousness remains because the reticular activating system (the part of the brain controlling wakefulness) is located outside the affected area. Similarly, vertical eye movements and blinking are spared because the supranuclear ocular motor pathways are located dorsally and remain unharmed.

Patients with this syndrome are quadriplegic and lack articulate speech but retain the ability to understand, feel, and form relationships. In principle, this should mean they can be held accountable for their actions and consciously exercise legal and civic rights — expressing treatment preferences, entering contracts, owning property, or voting. In practice, however, exercising these rights depends entirely on whether they can find a way to communicate them, which is precisely what made cases like Charlie's and Mauricio's so legally contested.

In early-2000s Spain, a locked-in patient known in legal scholarship as 'Charlie' was declared legally incapable and placed under guardianship — until he regained the ability to communicate via computer, after which Spanish courts restored his legal personhood. A second patient, 'Mauricio,' who could only communicate by blinking through a human intermediary, made a similar appeal but was denied by the Spanish Supreme Court — revealing that the law's recognition of personhood depends not just on whether consciousness exists, but on how convincingly it can be technologically demonstrated (Vidal, 2025).

Taken together, brain death, split-brain cases, and locked-in syndrome reveal a recurring problem of legal recognition. This paper's analysis suggests that legal personhood is not determined by consciousness alone; it also depends on the standards through which consciousness and capacity are recognized,

demonstrated, or inferred. When neurological function is judged irreversibly lost, the law recognizes death. When divided processing is observed, the law continues to treat the patient as one legal person. And when consciousness remains intact behind paralysis, legal recognition can depend heavily on the person's ability to communicate that consciousness.

If electricity is what makes a person aware, perhaps the deeper question is not whether the law can detect that awareness — but whether it should ever have the power to decide who counts as 'there' at all.

READING THE MIND: BRAIN-BASED LIE DETECTION AND THE LIMITS OF EVIDENCE

If electricity defines awareness and identity, it raises a tempting but dangerous question for the courtroom: can a person's brain activity be read directly as truth?

Functional MRI (fMRI) lie detection works on the idea that lying requires more cognitive effort than truth-telling, producing measurably increased blood flow to certain brain regions — a difference detectable via the scanner's blood-oxygen-level signal. Companies offering this technology have reported accuracy rates between roughly 70 and 90 percent, well above chance, but still short of what courts require.

In *United States v. Semrau* (2012), a federal court refused to admit fMRI lie-detection evidence, citing unreliable error rates and the gap between controlled laboratory conditions and the high-stakes, motivated environment of a real trial — a subject with everything to lose has far more incentive to 'beat' the scanner than a lab volunteer ever would. Courts have consistently applied the Daubert standard — the legal test for whether scientific evidence is reliable enough to be heard by a jury — and fMRI lie detection has so far failed to meet it on every occasion it has been raised.

A different EEG-based technique, 'brain fingerprinting,' developed by neuroscientist Lawrence Farwell, takes a narrower but more legally consequential approach. Rather than detecting lies directly, it measures a specific brain signal called the P300 — a recognition response that appears roughly 300 to 800 milliseconds after a person is shown information their brain identifies as familiar. By comparing a suspect's brain response to crime-relevant details against irrelevant ones, the technique claims to determine whether specific knowledge of a crime is 'present' or 'absent' in a person's memory — notably, without ever asking the subject a direct question or requiring them to speak.

This technique had real, life-altering consequences in *Harrington v. State* (2001/2003). Terry Harrington, who had served over two decades in prison for murder, was tested by Farwell, whose results indicated Harrington's brain held no memory of the crime-scene details, while it did recognize details from his alibi — each with a reported statistical confidence of 99.9 percent. An Iowa district court ruled the brain-fingerprinting evidence admissible under the Daubert standard, and Harrington was eventually released — though the Iowa Supreme Court's decision ultimately rested on a separate constitutional violation, not on the brain evidence itself.

Unlike fMRI lie detection, which has been uniformly rejected by U.S. courts, Harrington's case shows brain-based evidence can occasionally clear the legal bar — though even here, the court's ultimate

decision rested on conventional legal grounds rather than the brain evidence alone, leaving its true legal status ambiguous.

Both technologies ultimately answer to the same legal gatekeeper: the Daubert standard, the test U.S. courts use to decide whether scientific evidence is reliable enough to reach a jury. fMRI lie detection has failed this test outright, rejected for its unreliable error rates and the gap between lab conditions and real courtroom stakes. Brain fingerprinting fared better in a narrow sense — admitted once, in *Harrington v. State* — yet even there, the court's final decision rested on a separate constitutional issue, leaving the technology's true evidentiary status unresolved.

Together, these cases suggest that the law is willing to entertain the idea of reading the brain directly, but remains unwilling to fully trust it — perhaps because doing so would mean conceding that a person's innermost thoughts are no longer entirely their own to keep private.

PHILOSOPHICAL QUESTIONS AND SCIENTIFIC LIMITS

Every section so far has treated electrical activity as the foundation of awareness, identity, and even legal personhood. But correlation is not the same as explanation. Philosopher David Chalmers, who coined the term in 1995, distinguished between the 'easy problems' of consciousness — explaining how the brain processes information, integrates signals, or produces behavior, all of which neuroscience can map in electrical terms — and the 'hard problem': explaining why any of that electrical activity is accompanied by subjective experience at all. Knowing precisely which neurons fire when someone sees red does not explain why seeing red feels like anything, rather than occurring as pure, unfelt information processing.

Chalmers illustrates this gap with the 'philosophical zombie' thought experiment: imagine a being physically identical to a human, with the exact same electrical brain activity, behavior, and responses — yet with no inner experience whatsoever. If such a being is even conceivable, it suggests that physical and electrical processes alone cannot fully account for consciousness — there remains an unexplained step between 'the brain does this' and 'it feels like something to be this brain.'

This matters well beyond philosophy. Every legal and clinical standard explored in this paper — brain death, split-brain cases, locked-in syndrome, even brain-based lie detection — has relied on electrical activity as a proxy for consciousness, precisely because consciousness itself cannot be directly observed or measured. The hard problem suggests this is not simply a temporary gap in technology, but possibly a permanent limit: law and medicine may always be reading the shadow of consciousness, never consciousness itself.

This tension between what science can do and what its creator is prepared to handle returns us to where this paper began: Mary Shelley's *Frankenstein*. Reanimating the dead through electricity, as Victor Frankenstein attempts, remains scientifically impossible — bioelectric signaling can stimulate isolated muscle contraction, as Galvani showed, but it cannot restore the integrated, irreversible loss of brain function that medicine and law now define as death. Yet the novel's deeper warning was never really about whether reanimation is technically achievable. It was about what happens when a creator is unwilling to take responsibility for what they bring into being.

Victor Frankenstein's creature does not become monstrous because of some flaw in the reanimation process — it becomes monstrous largely because Victor abandons it the moment he is confronted with what he has made. His regret is not 'I created something evil,' but closer to 'I created something I was not prepared to face.' This distinction matters: the ethical failure in Shelley's novel is not scientific overreach itself, but the abdication of responsibility that follows it.

This same pattern echoes through every legal and clinical question this paper has examined. The law does not merely ask whether electrical activity exists in a brain — it asks who is responsible for recognizing, interpreting, or acting on that activity, whether in declaring death, granting personhood to a locked-in patient, or admitting brain evidence in court. Like Victor, modern law and medicine are repeatedly confronted with electrical evidence of life, awareness, or culpability that they did not fully anticipate having to interpret — and, like Victor, their response is not always equal to the responsibility the discovery demands.

LIMITATIONS

This review has several limitations. It is interpretive rather than systematic, and the selected cases and studies represent only a portion of the literature on consciousness, neuroscience, and law. The split-brain evidence is based on a relatively small and heterogeneous clinical population, while Libet's experimental paradigm concerns simple motor actions rather than complex legal decisions. Legal outcomes are also jurisdiction-specific and should not be generalized beyond the cases discussed. These limitations reinforce the paper's central caution: neural measurements can inform legal and clinical judgments, but their meaning depends on context, methodology, and the inferential step connecting measurable activity to subjective consciousness.

CONCLUSION – THE UNFINISHED PUZZLE OF CONSCIOUSNESS

This paper began with Galvani's twitching frog and Mary Shelley's reanimated creature — two images of electricity seeming to summon life itself. It ends somewhere far more uncertain: electricity may be the closest thing we have to a window into awareness, but it has never been proof of awareness itself.

Across each section, electricity served as a thread connecting biology to law, and law to philosophy. The brain's electrical signaling helps explain how neurons communicate, but not why that communication gives rise to felt experience. Libet's readiness potential showed neural activity preceding reported conscious intention in simple motor tasks, complicating — but not erasing — the legal and moral weight placed on free will. Brain death established a neurological boundary for determining death, while split-brain research showed that information processing and awareness can be more complex than the law's singular model of personhood suggests. Locked-in syndrome revealed the reverse problem: consciousness can remain intact while outward communication is severely impaired. Brain-based lie detection then brought the question into the courtroom, where the limits of reliability have constrained its evidentiary use.

What unites all of these cases is not a triumph of science over uncertainty, but a quiet admission of its limits. Law, medicine, and neuroscience all rely on electrical activity as a proxy for consciousness, precisely because consciousness itself resists direct observation. As the hard problem of consciousness makes clear, even a complete map of the brain's electrical activity would not explain why any of it feels like something to be alive, aware, or afraid. In this sense, Victor Frankenstein's failure was never really about reanimating a body — it was about mistaking the appearance of life for an understanding of it, and then being unprepared to face the consequences of that mistake. Modern law and science risk a quieter version of the same error: treating electrical evidence as a complete answer to questions about the self, when it may only ever be a trace of something deeper still left unexplained.

The scholarly implication is therefore not that electrical evidence should be rejected, but that its evidentiary role should remain proportionate to what the underlying science can actually establish. Neuroscience should continue to refine methods for detecting and interpreting consciousness; law should distinguish measured neural correlates from proof of subjective experience and avoid treating laboratory findings as direct answers to complex questions of responsibility; and future research should test these boundaries across larger, more diverse populations and real-world contexts. The deeper question remains: can a civilization built on observable evidence ever fully reckon with a mind it can detect, but not truly know?

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