

# Are We at a Turning Point in the Science of NDEs?

Neuroscientist Dr. Charlotte Martial describes the state of the research



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*Driven by a deep curiosity about the nature of consciousness, Dr. Charlotte Martial investigates conditions where individuals appear unresponsive, such as during general anesthesia or cardiac arrest, yet report episodes of consciousness, with a special emphasis the phenomenon of near-death experience. Dr. Martial earned her PhD from the Universi*

*Liège (Belgium) and completed a postdoc at Imperial College London (UK) before returning to the University of Liège. With more than 90 publications in specialized journals such as *Neurology Reviews*, her work has earned prestigious awards, including the IBIA Young Investigator Award. Dr. Martial is online on [Instagram](#), [Bluesky](#), and [LinkedIn](#). Her open access publications are also available online [here](#).*

In this essay you will read about:

- **Bringing NDEs into Healthcare:** Helping doctors and nurses recognize these experiences to better support patients through life-changing transformations
- **Better Assessment Tools:** Using scales like the NDE-C to understand these experiences while honoring their personal meaning
- **Working Across Fields:** Bringing together cognitive science, ethics, and medicine to put research into practice
- **Balancing Science with Openness:** Using rigorous research methods while staying open to the full range of these extraordinary experiences

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When are we conscious, and when are we not?

Today, scientists have yet to agree on a single definition for *consciousness*, as it can be viewed from many angles and frameworks. Sometimes, the best way to define something is by showing what it is not.

Over the past two decades, research has clearly shown that lack of response does not mean lack of consciousness (Sanders et al., 2012; Martial et al., 2020a). This has been shown across many types of physiological (e.g., dreaming during sleep), disease-related (e.g., disorders of consciousness), and drug-induced (e.g., general anesthesia) conditions.

In various states, people may seem unresponsive while still having episodes of either “disconnected” consciousness (i.e., internally generated, stimulus-independent mental activity) or “connected” consciousness (i.e., awareness of the outside world; Martial et al., 2020a).

Among these phenomena, near-death experiences (NDEs), which can be defined as rich episodes of disconnected consciousness typically reported after facing a life-threatening situation with no response, stand out as especially interesting yet remain understudied. Despite their deep psychological and existential impact, scientific study of NDEs is still in its early stages.

## ***Research has clearly shown that lack of response does not mean lack of consciousness.***

NDEs are not rare and have been reported worldwide across different cultural (Peinkhofer et al., 2021) and religious (Greyson, 1993) backgrounds.

Research has shown that 10-23% of cardiac arrest (Parnia et al., 2014; van Lommel et al., 2001; Schwaninger et al., 2002; Greyson, 2003), 3% of traumatic brain injury (Hoch et al., 2013), and overall 15% of intensive care unit (Rousseau et al., 2023) survivors report a classical NDE (i.e., experienced in life-threatening situations).

Furthermore, about 5% of people worldwide report having had such experiences at some point in their lives (Knoblauch et al., 2001; Perera et al., 2005; Schmied et al., 1999). While we now better understand how often NDEs occur in some specific

settings, the wide range of contexts, and the varying nature of these experiences, c for a broader view.

For instance, near-death-like experiences (NDEs-like), namely similar subjective experiences in non-life-threatening situations, have also been noted in many diffe settings (Charland-Verville et al., 2014). As shown by Martial et al. (2025), the traditional strict division between classical NDEs and NDE-like experiences is becoming outdated.

Today, this division is being questioned, especially as we see that telling the differ between actual and possible life-threatening events lacks objectivity. Rather than looking at outside circumstances, we should consider a wider range of factors to b describe the phenomenon.

## Toward a Scientific Understanding of NDEs

At first glance, NDEs may seem to challenge standard models of consciousness by showing that vivid, immersive conscious experiences can happen even in extreme physical crises—situations where we would not usually expect consciousness to continue.

From my view, this “paradox” has greatly contributed to the popularity of nonloca consciousness theories in both literature and media discussions. These theories suggest that consciousness might exist apart from brain function—although solid evidence for these ideas remains lacking.

The lack of a strong explanatory framework and the basic difficulties in studying NDEs—mainly due to their unpredictable nature—have historically slowed scient progress in this field. Thankfully, this is starting to change.

The recent quick growth of empirical data from various areas of neuroscience, including animal research, studies using psychedelics, and studies of the dying bra



combined with new technology enabling real-time brain monitoring, is providing more and more convincing neurochemical explanations for how NDEs emerge.

Working with my dear colleagues, we recently developed a strong, complete psychoneurophysiochemical model that helps explain how these rich and deeply stored experiences can occur during severe physical crises (see [Martial et al., 2025](#), for details).

What might first seem contradictory—the emergence of rich experiences during critical conditions—becomes more understandable, and even very logical, when viewed through the lens of our proposed framework that is based in an evolutionary perspective.

This model, which we call the Neurophysiological Evolutionary Psychological Theory of Understanding Near-Death Experience (NEPTUNE), is named to reflect the extreme detachment and return to “reality” often described by NDE experiencers, symbolically Neptune, the most distant planet in our solar system.

Simply put, our model suggests that NDEs may result from a series of psychological and neurophysiological processes triggered by a critical lack of oxygen, low blood pressure, and natural chemical imbalances within the brain. These factors may lead to a surge in neurotransmitter activity, especially in regions tied to consciousness.

Our research has examined the main brain neurotransmitter systems and their possible roles in shaping different features of the NDE.

For example, we propose that the serotonergic and dopaminergic systems contribute to the vivid visual content, while glutamatergic, cholinergic, and noradrenergic systems play key roles in storing the memory of the event. The feelings of deep peace and detachment may be linked to serotonergic, endorphinergic, and GABAergic activity.

***Our research suggests the brain's remarkable ability to create meaning persists even in extreme conditions, helping people cope with life-threatening experiences.***

Also, the deep sense of hyper-reality commonly tied to NDEs may come from increased dopaminergic activity. Along with these neurochemical mechanisms, we also highlight the role of personal traits, such as a tendency toward dissociation, that might help this neurophysiological cascade.

Placed within an evolutionary context, NEPTUNE proposes that NDEs are not random events but rather natural mental states that serve as a defense mechanism response to life-threatening stress. In line with the evolutionary hypothesis we recently suggested ([Peinkhofer et al., 2021](#)), we suggest this adaptive function may help people mentally process the extreme experience, potentially leading to deep and lasting changes in their worldview, beliefs, and behavior.

By combining neuroscience, psychology, and evolutionary theory, the NEPTUNE model offers a strong explanation for how and why NDEs may occur. Rather than seeing these experiences as oddities that defy scientific understanding—and there is sometimes assuming that science cannot properly explain them—we suggest they show the brain's amazing ability to create meaning and maintain consciousness even in the face of extreme hardship, ultimately helping people cope with such experiences.

In parallel, an important recent development in the field is that studies examining recordings taken just before the end of EEG activity have recently connected with emerging NDE literature. In 2009, [Chawla et al.](#) published a groundbreaking study reporting the observation of brief electrical spikes in critically ill patients just after a steady decline in EEG indices following loss of blood pressure.

Interpreted by the authors as “approached levels normally associated with consciousness,” this was discussed as being linked to NDEs and raising questions about their meaning. Similar patterns were later found in animals, where cardiac arrest or acute lack of oxygen was linked to a brief global increase of functional connectivity in gamma oscillations ([Borjigin et al., 2013](#); [Li et al., 2015](#)).

Later, human studies confirmed that in some cases ([Vincente et al., 2022](#); [Xu et al., 2023](#)), the dying brain shows a surge of gamma waves, especially in areas thought to

crucial for consciousness. Thus, this brain activity pattern has been suggested to possibly be a brief window in which NDEs could arise.

As rightly stressed by the authors of these articles, while interesting, these findings should be approached carefully, as no interviews could be conducted due to the patients' imminent death. More research is needed. As noted by Martial et al. (in press), while NDEs and the cellular processes of a dying brain are separate phenomena, studying them together can offer valuable insights into both.

Understanding the mechanisms of death and the gradual return of brain activity at resuscitation may help shed light on the neural basis of NDEs. However, complex questions remain.

As this is so clear, our position is based on the observation of a growing body of evidence from various fields of (neuroscience-based) physicalism that increasingly support the connection between (neuro)physiological activity and consciousness.

That said, I acknowledge that science is a constantly evolving field, and many deep mysteries and unanswered questions remain. I remain hopeful about the potential future advances in scientific tools and methods.

As our ability to measure, analyze, and interpret complex neurophysiological functions improves, I believe that phenomena which currently escape our understanding may eventually be explained by science, allowing us to solve even the most difficult aspects of consciousness.

## Clinical Implications of Understanding NDEs

Clinically, NDEs hold deep meaning for patients and healthcare providers alike. I believe that research will soon provide enough evidence to convince healthcare professionals to include NDE recognition in patient care pathways. Given the deep and lasting impact

NDEs can have on mental well-being, social attitudes, and spirituality, this seems a key step forward.

These experiences can be highly meaningful and life-changing for those who have them, raising important clinical concerns. While NDEs often lead to major life changes that can be seen as positive, such as less fear of death or more empathy, they can also create unique challenges, such as trouble in mental integration or major shifts in beliefs (Michael et al., under review).

Also, difficult NDEs can cause severe mental distress. As well stated by [Brouwer and Carhart-Harris \(2021\)](#), NDEs could even be seen as “pivotal mental states,” suggesting that these are not just *events*, but complex *processes* with special potential to trigger lasting mental changes.

To study NDEs in practical terms, researchers use standard scales designed to assess and measure the subjective nature of these events. One such tool, the Near-Death Experience Content (NDE-C) scale ([Martial et al., 2020b](#)), has 20 items and gives a score that reflects how rich the experience is—a score that can be used to compare different cases, group people for analysis, or explore links with other data.

***Every reported NDE, regardless of its score on assessment scales, is meaningful to the person who experienced it.***

A score of 27 out of 80 is commonly used as a cutoff to identify an NDE in research settings. This cutoff score can be seen as best for studies aiming to include rich enough NDEs, especially since no specific feature appears in all NDE reports (e.g., [Charland-Verville et al., 2014](#); [Martial et al., 2017](#); [Martial et al., 2020b](#)). While this approach works for research, it may be less useful in clinical settings. Every reported NDE, regardless of its score, is meaningful to the person who had it.

Rather than being a strictly defined event, I think that NDEs likely exist on a spectrum, with varying levels of intensity and content. Like other altered states of



consciousness, such as hypnosis, meditation, or trance, there is no absolute way to pinpoint when someone enters an NDE state. Understanding this range is key for scientific study and the clinical importance of these extraordinary experiences.

In the end, I believe that studying NDEs could play a major role in improving our understanding of critical care and consciousness at the end of life. To achieve this is essential to build a bridge between neuroscience and clinical practice. While NDE research has the potential to inform ongoing debates about how consciousness emerges during near-death conditions, the clinical implications of these findings remain largely unexplored.

Understanding how consciousness shows up or continues in such extreme states could challenge current views on end-of-life care, possibly leading to new approaches in patient care and treatment plans. However, much more research is needed to turn these insights into practical clinical applications, which would require teamwork across various fields, including neuroscience, ethics, and clinical medicine.

In the end, bringing NDE findings into critical care could offer a more complete and compassionate framework for understanding consciousness at the edge of death, with deep implications for both medical practice and the patient experience.

## The Challenges and Rewards of NDE Research

My journey into the study of NDEs began unexpectedly, yet it quickly became a subject of deep interest. How could it not be, given the nature of these accounts? My story raises basic questions: What exactly are these experiences? What really happens during an NDE? These questions echo the philosophical ideas that fascinated me as a teenager, now explored through scientific study.

Studying such an unusual topic is both exciting and challenging. Beyond the trouble of getting funding, this field needs persistence against doubt and the skill to work around common misconceptions.

To keep credibility with scientists, it's vital to follow strict research methods, make sure findings stay based on real evidence and free from personal beliefs or ideological bias. This matters especially because of the deep impact of NDEs, which easily lead to ideas that go beyond science.

A main challenge is sharing scientific findings in a way that connects with both the wider scientific community and the medical field—which often views such topics carefully. In my view, making sure NDE studies are seen as helping advance neuroscience and medicine requires balancing careful testing with clear, easy-to-understand sharing of results.

***Studying experiences at the edge of consciousness could transform end-of-life care, offering a more compassionate framework for understanding the patient experience.***

It's also important to note that researchers in this field, perhaps more than others, are limited by the tools they have at any time. These limits naturally affect our ability to fully study NDEs and what causes them, whether looking at the idea that brain processes cause NDEs or considering that consciousness might exist outside of brain activity.

Though it may surprise some colleagues, I often find myself moving between two different groups. On one side, the scientific community, which follows modern scientific methods, was at first somewhat doubtful about studying NDEs.

However, over the past ten years, there has been a clear shift, with more interest in the topic, and NDEs are now being more included in various areas of brain research. On the other side, a wider audience with special interest in NDEs that tends to support a view beyond physical explanations, often sees my ideas as unlikely—even though my ideas are supported by the scientific community.

This difference still creates thought-provoking talks, whether through discussions of theoretical ideas (e.g., [Martial et al., 2023](#), in response to Holden, 2023) or debates about research data and methods (e.g., [Martial et al., 2024](#), in response to [Parnia et al., 2020](#)). No matter which group someone belongs to, I support both scientific care and open-mindedness in studying this phenomenon.

To fully understand human consciousness and its complex range of subjective states, I believe we must study experiences that happen at the edge of this range, such as NDEs during extreme physical crisis.

These events are neither uncommon nor unimportant. Instead, they offer deep insights into how the human mind works, connecting fields from brain science to philosophy and beyond.

I think we're at a turning point in NDE research; what was once seen as a marginal topic, often pushed aside as unexplained or speculative, is now getting more and more acceptance within the scientific community.

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Peter Panagore, MDiv 15 avr.

Liked by Coming Home

I am a two-time near-death experiencer whose life was radically and permanently altered by what I experienced. Even so, I encourage scientific research into NDE. I want to know what science thinks.

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Matt Doszkocs 18 avr.

Science has yet to demonstrate that the brain produces consciousness, called "the hard problem." Any theory on a physiological cause of NDEs is already questionable at the foundation. What we DO know is that 96% of the Universe is invisible ("dark" matter and energy combined). That's a big question mark, and a good indication of something else beyond the veil of physical reality. I mention that every NDE report I've ever heard of has described something more real than this not dream-like, and many times these individuals witness and can accurately recount events even away from the body during their flatline. What are these materialist "scientists" so afraid of? I'm guessing these people are corporate shills or atheists (who are btw often the most dogmatic and fanatical of fundamentalists) hired to brainwash and propagandize the public into accepting materialist-only views of reality in order that corporate law and the investors they serve can continue to run roughshod over our shared environment for profit. If everything is conscious, or if souls have experience actual karma for their deeds in life (ie life review) the corporate-ruled kleptocracy that currently exists would crumble.

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