

# Commentary on *After: A Doctor Explores What Near-Death Experiences Reveal About Life and Beyond*, by Bruce Greyson, MD

Pascal Michael, MSc  
*University of Greenwich*

**ABSTRACT:** Near-death experiences (NDEs) are a typically profound set of experiences occasioned during both actual and subjective proximity to death. In March of 2021, Bruce Greyson, MD, one of the original researchers founding the field of near-death studies, published the book, *After*. It represents a thought-provoking and highly readable chronicling of an almost half-century of both his impressive scholarship and personal experience of changing worldview. In the present article, I provide a thorough essay-style analysis of the publication, focusing on how much of what Greyson reported is consistent with, yet also lacks considerable recognition of, the model of NDEs provided by a psychedelic framework. That is, substantial explanatory power can be derived from considering NDEs as a psychedelic phenomenon in terms of possible neurobiological correlates, its acute state, long-term sequelae, and putatively parapsychological effects. In writing this article, I hold no *a priori* ontological assumptions but hope at least to offer the necessary neurally-oriented explanations where the literature indicates them. However, I also note that certain NDE dimensions may not yet be fully explicated in terms of such a reductionist paradigm, and even where they could be, the ‘hard problem of consciousness’ is still to be resolved within the natural sciences. Although I believe the book would have benefited from this embrace of the phenomenon’s likely mediation by such endogenous neurotransmission, or convergence on similar mechanisms, I nevertheless affirm that Greyson has delivered a laudable exposition of the transcendent experience as having deep psychiatric, personal, interpersonal, ethical, and possibly meta-physical implications.

**KEYWORDS:** near-death experience, psychedelics, DMT, psychopharmacological model, neural correlates

---

**Pascal Michael**, MSc, is a PhD candidate in Psychology and Counseling, School of Human Sciences, University of Greenwich, London, England, UK. Correspondence regarding this article should be sent to Mr. Michael at e-mail: p.michael@greenwich.ac.uk.

In this article, my purpose is to provide detailed commentary on, rather than a typical review of, the recently published book, *After*, by psychiatrist Bruce Greyson (2021). The book provides an impressive synthesis of his last half-century of research on the phenomenon of near-death experiences (NDEs) directed at a popular audience. I found *After* to be thoroughly enjoyable, an evident memoir of a now-retired physician's scholarly work on the enigmatic phenomena of NDEs, largely walking the reader through his journey from materialist assumptions to a very open-minded perspective, sympathizing with a more transcendentalist interpretation, with which he culminates the book. Greyson, a luminary in NDE scholarship, having penned more articles on the subject than anyone else (Loseu et al., 2013), has provided a scientific map of his, and some others', research.

However, I was inspired to write this article by several factors. They include my own research into the neuroscientific correlates of NDEs and the dying brain-state, as well as the exponentially burgeoning discipline of psychedelic studies. Another factor was Greyson's oftentimes-stated sentiment that he could offer no other explanation for some of the observations he described. Rather, I contend that the above-referenced research provides substantial explanatory power. With this article I hope to shine a light on a blind spot—absence, in particular, of attention to psychedelic research—which I have observed both in *After* and in the field of near-death studies in general. Thus, I will focus on only those chapters (the majority) I consider pertinent to this subject, centering largely around the many case studies Greyson presented.

### Commentary

Beginning with the sixth chapter, in which Greyson focused on the out-of-body experience (OBE), especially those with potentially verifiable or 'veridical' information, he described the typhoid-associated NDE of military surgeon Alexander Ogston in 1900 in which he reported floating contentedly far away from his body, only to suddenly return to it when "something disturbed the body where it lay" (p. 71). Greyson noted that Ogston's case was reminiscent of the later-described Kirsten's case in which, in the midst of an epileptic discharge-induced OBE, at the point that her physical senses were engaged, she subjectively perceived an abrupt return to her body. Authors of a recent paper may have described a pertinent parallel, whereby in subjects under the influence of a psychedelic, when their visual systems were engaged in

watching video content, both their subjective psychedelic experience and its associated brain entropy were suppressed, which the authors attributed to “competition between external stimuli and endogenous LSD-induced imagery” (Mediano et al., 2020). The psychedelic cases suggest the possibility that in both Ogston’s and Kirsten’s NDEs, their subjective experiences may have resulted from the release of endogenous psychedelic molecules near death.

Moving on to Chapter 7, the thrust is Greyson’s evaluation, psychiatrist as he is, of whether NDEs can be considered a syndrome akin to mental illnesses. Justin’s experience with LSD, the prototypical classical psychedelic, is one extraordinary case study that Greyson presented. After “over-dosing” on “three tablets”—despite LSD coming in the form of blotter paper rather than tablets and physiological over-dose being impossible with this class of substances—on top of almost an hour of smoking cannabis—with psychedelic and cannabis co-administration known to considerably heighten the intensity of the experience (Kuc et al., 2022)—Justin’s “mind was out of control” and his “worst nightmares were coming true” (p. 83). Then he collapsed, his friend later claiming he stopped breathing, whereupon Justin perceived a separation from the body and a feeling of engulfing love. Greyson asserted that Justin’s subjective experience from the point of collapse was characteristic of NDEs, and not characteristic of LSD experiences, and that his NDE seemed to cure his ‘bad trip.’ Grof (1994) and others, however, have documented that this death-rebirth-type experience is not monopolized by NDEs but is also virtually prototypical of the psychedelic state (Winkelman, 2002, 2010), especially the *Deus ex machina* motif in which sudden divine intervention seems to scatter the harrowing demons. Thus, Justin’s entire journey, from ‘fathoming hell’ to ‘soaring angelic’—as went the limerick coining the term *psychedelic*—could very well have been exclusively a product of the LSD. Furthermore, even if Justin’s case was indeed an NDE facilitated by his loss of consciousness and cessation of breathing resulting in anoxia, his resulting dissociation of mind and experience of bliss could still be attributable to the chemical cocktail primed to be released upon such physiological conditions, which includes LSD-like endogenous compounds. All this said, however, from a more non-materialist perspective, if the OBE is truly non-local, then Justin’s statement that “as soon as I left my body, that hell left me” (p. 83) would suggest that his consciousness actually left his body, thus rendering the condition of his brain—including the inchoate ‘acid bumper’ and any hypothesized release of endogenous psychoactive

molecules—entirely irrelevant. In this way, Greyson’s interpretation that Justin’s putative NDE overcame his distressing LSD trip is a valid one, but equally valid are the interpretations that Justin’s relief was but another phase of his LSD trip or was the result of the anoxic release of chemicals intrinsic to the brain.

Another so-called near-death experiencer (NDER), Stephen, and his and his lilliputian hallucinations when he overdosed with opioids, is equally fascinating. Sometime after taking the pills, he was surprised to suddenly awaken to an ensemble of ‘midgets’ milling around him—a meme of some psychedelics, especially dimethyltryptamine (DMT; the short-acting serotonergic tryptamine) experiences and neuropsychiatric hallucinations (Blom, 2021)—but certainly not NDEs. Most tellingly, Stephen reported eventually leaving his body and viewing himself from a distance—though from this vantage point no longer seeing the dwarfy denizens; as he said, “my body was confused . . . but my mind was crystal clear. *I* wasn’t hallucinating, but my *body* was” (p. 86). This case definitely echoes the former case in which Justin may have transcended his LSD-infused brain by a subsequent NDE. However, similar to the alternative in Justin’s case, Stephen’s wholly detached OBE was most likely triggered by his sedative-overdose-induced brain hypoxia disrupting highly sensitive brain regions, namely the temporo-parietal junction (TPJ), known to induce OBE-like phenomena when stimulated or diseased (Blanke et al., 2015). A novel interpretation of Stephen’s ‘double consciousness’ might be that, given the TPJ is engaged not only in multi-sensorial integration but also, crucially, in dreaming (Scarpelli et al., 2019), it is implicated in the construction of internal mental models of the world. As such, the OBE here would naturally not incorporate the hallucinated ‘little people,’ as they don’t constitute part of Stephen’s internal representation of his physical environment. On another note—pertinent for both cases, but particularly Justin’s, as well as for Greyson’s psychiatric profession—not discussed were the implications of the capacity of NDEs to somehow overcome psychiatric, even psychotic, symptoms—though elsewhere Greyson cited his research on possible *protective* properties of NDEs (Greyson, 2003). The renaissance in psychedelic psychiatry is harnessing these ‘entheogenic’ tools, mainly for relief from depression or anxiety disorders, meaning both that similar brain-derived compounds could be eliciting similar effects in NDEs and psychedelic experiences and that distinctly NDE-like phenomenology in psychedelic experiences may have a key therapeutic role (Michael, 2022).

In Chapter 8, Greyson framed the section with his steadfast confidence that NDEs are very different from hallucinations. Elsewhere in the book, however, Greyson readily cited an article showing significant resonance between the phenomenologies of the classical, endogenous, psychedelic DMT and NDEs (Timmermann et al., 2018), as well as his own co-authored work demonstrating striking similarity between serotonergic and dissociative psychedelic experiences and NDEs (Martial et al., 2019). Additionally, Greyson later stressed the lasting vivid memories of NDEs enshrined into experiencers' minds, as well as their resolute declarations of the reality of the experiences. Especially the latter phenomenon of hyperreality is a classic component of the unique visionary experience—often framed as 'veridical', as compared to other serotonergic psychedelics retaining a sense of 'insight'—engendered by DMT (Cott & Rock, 2008; Davis et al., 2020; Michael et al., under review-c). Although the DMT 'flash' is often a challenge to recall in detail, this difficulty may be a function—as indeed are probably *most* discrepancies between the psychedelic and NDE states—of the NDEs involving very many different inter-locking neural events. In this case, elevated noradrenaline during the dying process (Li et al., 2015) may well account for the characteristic crystal-clear memory, as infusions of the stress hormone significantly enhance recall, whereby *endogenous* stress hormones modulate memory consolidation for experiences inducing their own release (Cahill & Alkire, 2003)

In Chapter 9, scoping out the biology of dying, readers meet Kirsten, whose brain malformation at the midline of her parietal lobes, crucial for bodily schematic mapping, has caused her since childhood to experience not only absence seizures but also OBEs. That Kirsten also described Wernicke's aphasia, as well as Broca's aphasia, suggests an influence on her temporal cortices—thus indicating both parietal and temporal zones being implicated, possibly encompassing the temporoparietal junction, which is the area involved in other tumor or epilepsy patients who also have also reported OBE phenomena (Blanke et al., 2015). The fact that she also apparently trivialized her out-of-body sojourns as virtually always veridical is interesting—and, if legitimate, may be suggestive of models of consciousness accommodating of non-locality. Even such corroborated OBEs as this, however, though routinely used by Greyson to gesture at a survivalist account, may be only a transient phenomenon prior to permanent death. As such, this phenomenon would not *per se* represent a dualistic dislocation from the body but, rather, would indicate apparently 'perspectival' extra-

sensory processes—that is, psi effects presenting with OBE-like phenomenology—and, thus, would not be evidential of permanent posthumous survival (e.g., Braude, 2003).

Later, Greyson made fair critiques of research suggesting similar neural processes of REM sleep to also undergird NDEs. One is that NDEs occur under anesthesia despite REM-related activity being suppressed. However, although some authors have pointed to awareness during anesthesia being attributable to incorrect preparations or individual differences, my more novel suggestion would be that any release of psychedelic-like neurotransmitters under hypoxic conditions, such as during significant surgical complication, may well modulate how effective the anesthetic is, thus overcoming a threshold for consciousness. Indeed, this conjecture is given much more evidential credibility considering proposals to administer psychedelics to those in coma-like states (Gosseries & Martial, 2020; Scott & Carhart-Harris, 2019), on account of such states being characterized by low neural entropy—a measure of richness of consciousness—and of psychedelics fundamentally enhancing such entropy (Carhart-Harris, 2018; Carhart-Harris et al., 2014). Additionally, Greyson cited Britton and Bootzin (2004) who found REM sleep to supposedly be lower in NDErs versus the general population, arguing therefore that REM is unlikely implicated in NDEs. This finding, however, is inconclusive, as although REM latency was higher and number of REM periods lower in NDErs compared to non-NDEr controls, total REM sleep was equivalent. Also, being a non-prospective study and given significant brain effects of undergoing an NDE, it is very possible the REM observations reflect consequences versus predictors of NDEs. Schindler et al. (2018) found that the use of classical psychedelics may similarly have the consequence of delaying REM onset and reducing REM sleep; this parallel with findings about NDErs' REM provides additional support for my contention that psychedelics provide a robust model for NDEs. Greyson then cited a study by Palmieri et al. (2014) stating that brainwaves linked to NDE memories were dissimilar to those linked to fantasy or dreaming and, instead, were found to be akin to memories of real events. This finding is only partially the case, as the NDE memories actually correlated with slow-wave theta (as well as delta) bands, including at temporal zones—crucially, a correlate also of not only dreaming but also psychedelic states (Carhart-Harris, 2007; Timmermann, 2019). And the gamma activity found to be associated with recall of real events was *not* associated with NDE memories, leading

Palmieri et al. to suggest that NDEs result from “an internally generated experience, e.g., hallucination-like” (p. 9).

At the close of the chapter Greyson stressed that patients given medication report fewer NDEs and that this finding is curious given the admitted similarities between hallucinogenic trips from drugs like DMT and ketamine. Hopefully, Greyson was not in turn suggesting a similarly inverse relationship between these psychedelics and NDEs, as they are pharmacologically and qualitatively different to any medication given in traumatic or palliative settings. He then went on to describe his aforementioned co-authored paper demonstrating a host of dissociative atypical psychedelics and classical serotonergic psychedelics having very high semantic similarity to NDEs (Martial et al., 2019). However, he mentioned only ketamine, downplaying the resonance by stating that many effects of ketamine trips are not found in NDEs. Although discrepancies certainly exist, there is still substantial similarity—*notwithstanding* one comparison in which researchers used the NDE Scale (Greyson, 1983) and found the ketamine-NDE overlap to be likely inflated (Corazza, 2008); analogously, the far broader repertoire of different content in DMT trips versus NDEs was also evident in my own research (Michael et al., 2021). Such remaining comparability, though, still requires that these models not be entirely defenestrated but, rather, be encompassed in a larger model that likely necessarily incorporates multiple processes and their interactions mediating at least as many phenomenological elements. As brief examples, endorphins may relate to equanimity, TPJ disinhibition to OBEs, and, as elaborated herein, ‘endo-psychedelics’ to visionary transcendence (see Michael et al., under review-a). Greyson nodded at this point when he invoked the parable of the elephant’s parts being surveyed by different blind people failing to comprehend its wholeness—but counter-intuitively used it instead to critique that whereas all the models roughly analogize one feature, none adequately explains NDEs in totality. I consider this view to be overly simplistic, considering that such singular models were common early in NDE research. NDEs are highly complex phenomena and, as such, should not be expected to have such an unfairly ‘parsimonious’ explanation.

Finally, Greyson stipulated that

in spite of the theoretical reasons for thinking brain chemicals might be involved in NDEs, at this point, there has been no research looking into this possibility. And I don’t expect any such research to be done in the near future. Bursts of these chemicals in the brain tend to be very



short-lived and localized, so in order to find them, we'd have to look at exactly the right time at exactly the right place in the brain. (p. 110)

Regrettably, this assertion is simply untrue. As I previously mentioned, Li et al. (2015) and Dean et al. (2019) represent two major studies in the progressively advancing field of the cognitive neurophysiology of the dying process, paradigm-shifting the way neuroscientists conceive of the dying brain not as disorganized and failing but rather as transiently hyper-functional. Although, admittedly, these studies employed rodents at the time of genuine death, the patent significance and import of these experiments for NDE science should be recognized. The former study identified that after rat asphyxia a plethora of neurotransmitters rise, sometimes dramatically, in concentration, including glutamate, GABA, and all major monoamines. Serotonin, in particular, is elevated to an extraordinary 250-fold baseline levels in the frontal cortex at four minutes. This observation is extremely salient, if considering findings of serotonin itself to induce the “psychedelic signature move” (Buchborn, 2019) in mice, which proxies hallucinogenic activity (Schmid & Bohn, 2010). This point also speaks to Greyson's comment above as to the transmitters' “short-lived and localized” release; in fact, these changes were measured per minute and up to 20 minutes in multiple lobes of the cortex. Similarly, in the latter study, Dean et al. demonstrated DMT—not as yet embraced as a ‘canonical’ transmitter—to be of similar baseline levels to serotonin, and, importantly, to spike by over 6-fold upon experimental rodent death (here, only measured in the occipital cortex at 15-minute intervals). These findings provide compelling empirical research, striding beyond theory, to suggest brain chemicals may well be involved in NDEs.

In the next chapter, the centerpiece is Eben Alexander's NDE of some renown. Occasioned by severe meningioencephalitis, the depth of his experience scored in the top 2% according to the NDE Scale, and though his Glasgow Coma Scale score oscillated between 6 and 11—the upper end of this range allowing for some responsivity—veridical perception putatively occurred when the score was only 6–7. In this way, Alexander's report may be a significant challenge to the conventional neurocentric view of consciousness being a function of the brain—but also, importantly, because *prima facie* it does not fit the paradigm suggested in this article: that NDEs may be predicated on endogenous psychoactive neurochemicals. This exception is because the well-described progressive brainstorm of neurotransmitters



instigated during cardiac-arrest (Dean et al., 2019; Li et al., 2015) and loss of oxygen to the brain—the convergent endpoint of most etiologies of death—does not readily apply to Alexander’s case of coma due to encephalitis. This being said, the idea of Alexander’s neocortex being uniquely devastated over-and-above heart attack—as offered in Greyson’s scientific report on the case (Khanna et al., 2018)—could have disinhibitive effects in the brain, whereby disruptions to otherwise suppressing higher-order networks may lead to release of intrinsic neurochemicals—and so be precisely the reason for the NDE’s production; in a separate article, I expand on this novel neural account of Alexander’s case (Michael et al., under review-b). Also importantly, although Alexander’s CT scans and blood results indicated virtually no chance of survival without significant brain damage, no EEG, nor any functional neuroimaging tool otherwise exploring activity instead of structure, was ever recorded—ironically because the medical team felt no clinical use would come of it, given the poor prognosis. All this being so, irrespective of efforts to locate some dimension of brain activity during these exceptional experiences—as Greyson himself quoted philosopher Alva Noe—ultimately, “after decades of concerted efforts on the part of neuroscientists, psychologists and philosophers, only one proposition about how the brain makes us conscious . . . has emerged unchallenged: We don’t have a clue” (Greyson, 2021, p. 117).

Chapter 11 is also especially germane for my focus in this article on both the phenomenological and neurobiological relevance of psychedelic experiences for NDEs. In it, Greyson (pp. 122–123) quoted at length a beautiful excerpt from Anita Moorjani’s NDE narrative, capturing the sheer expansiveness of her near-death awareness and illustrating the chapter’s premise and title that “the mind is not the brain.” Moorjani painted a metaphoric picture of life in mundane waking reality as akin to being in a great, dark warehouse with nothing but the single beam of a flashlight—until, tantamount to her state of consciousness near-death, all the switches are suddenly flicked on, and the void is flooded with a deluge of light. This very image alone, alongside a great many more of her descriptions, are again very reminiscent of profound psychedelic states. For example, whereas in normative consciousness “you can only see what your light is focused on . . . and we can only understand what is already familiar,” after the transformation by the light, “even the objects you were aware of have an entirely new context so that they, too, seem completely new and strangely surreal” (p. 122). This phrase neatly echoes the neural

model of psychedelic activity, wherein the predictive processing of the cortex habituates people to the world they have learned, until psychedelics undermine the predictive coding hierarchy, and so allow into awareness raw sensory data that is imbued with freshness and hyper-vividness (see, for example, Carhart-Harris & Friston, 2019). That Moorjani's NDE imparted the sense that "you're actually part of . . . a large and unfolding tapestry" and a sense of "how all the various parts are inter-related . . . how everything fits" (Greyson, 2021, p. 123) also ring of the acute and lasting revelations of connectivity inspired by psychedelic molecules (Carhart-Harris et al., 2018), itself poetically mirrored by the hyper-connectivity evident within the brain under psychedelics (e.g. Carhart-Harris et al., 2016; Tagliazucchi et al., 2016).

Shortly thereafter, Greyson in fact turned to the oft-repeated words of Aldous Huxley, who, in his book *The Doors of Perception*, immortally remarked that "Mind at Large has to be funnelled through the reducing valve of the brain . . . What comes out at the other end is a measly trickle" (Greyson, 2021, p. 127). What Greyson strangely omitted to mention is that this was Huxley's conclusion after his first experience on mescaline, the phenethylamine psychedelic in San Pedro or peyote. Later, again conflating that suggestions of the mind operating separately from the brain reveal the brain acting as a filter, Greyson cited studies on the prefrontal cortex (PFC) and synchronised activity across the brain being involved in gating information to consciousness. Once again, such studies are still consistent with psychedelic neuroscience, wherein the mPFC is part of the brain's default mode network (DMN), which correlates to the normally inhabited, self-referential state of mind and which is the central network desynchronized under psychedelics (Muthukumaraswamy et al., 2013). The question, if invoking mind-beyond-brain 'transmission theories' of consciousness, naturally arises then: Where is this 'Mind at Large' supposedly being transmitted from? Psychedelics, by definition, are 'revealers of mind'—and this point is perfectly reflected in the present, at least, neuroscientific models of psychedelic action. For example, in their model of the 'anarchic brain', Carhart-Harris and Friston (2019) asserted that the resultant expansion of consciousness derives from intrinsic, rather than extrinsic, processes—that is, from the disinhibited lower strata of the cortical or subcortical hierarchy that create a more 'entropic,' or chaotic, brain-state which, in turn, produces heightened states of consciousness.

This dynamic comes most crucially to bear on one of Greyson's fi-

nal points in the chapter, in which he referred directly to the neuroimaging studies on psychedelics pioneered in the last decade (for example, Carhart-Harris et al., 2012; Carhart-Harris et al., 2016), to bolster his argument that reduced (or no) brain activity gives way to expanded consciousness. He emphasized the psychedelic mystical state to be associated with “*decreased* brain activity” when this finding was “the exact opposite of what we had expected” (p. 129), that is, from hallucinogenic drugs. Referring to the desynchronization of the Posterior Cingulate Cortex (PCC) of the DMN, he stipulated that “profound experiences may be associated with decreased brain activity and decreased *connectivity* between different regions” (p. 129; italics added). Not acknowledged is that the overarching mechanism of psychedelics appears to be their disruption of the integration of the intrinsic DMN which serves as a central ‘hub’ of neural connectivity, resulting in ‘desegregation’ of global brain regions, ultimately leading to a ‘hyper-connected’ brain-state of different circuits normally shielded from mutual influence. Thus, in Greyson’s omitting the *increased* global connectivity, which is likely itself a key correlate of the heightened state of consciousness—according to theories of consciousness focusing on integration of information (Seth et al., 2011) as well as psychedelic neuroimaging (Lebedev et al., 2015; Tagliazucchi et al., 2016)—the ‘apparent less activity = more consciousness’ paradox presents only an illusion of internal consistency.

In Chapter 12, Greyson focused mostly on so-called ‘Peak in Darien’ experiences in NDEs, in which people meet deceased loved ones they did not know were dead—an impressive phenomenon that Greyson suggested may point to some post-carnate survival. Again, however, reminiscent of my earlier point regarding veridical OBEs, Peak in Darien experiences could be attributable to parapsychological processes, for instance, precognition, given the experiencers’ subsequent learning of the others’ deaths. This being said, as Greyson noted, some cases are remarkable, including one related by Pliny the Elder in the first century, as the returned near-deceased immediately related his encounter with the actually-deceased prior to having himself been informed of the death. Ayahuasca, the DMT-containing Amerindian shamanic brew, or Iboga, the West-African shamanic rootbark, are examples of indigenous use of psychedelics with express functions of communicating with the dead. However, in particular, the former ayahuasca vine’s constituent harmine was first termed ‘telepathine,’ owing to the apparently extra-sensory capabilities it conveyed, which often also encompassed learning of the deceased’s demise (Luke, 2011;

see Luke, 2012 for a comprehensive review of anomalous phenomena under psychedelics). This additional similarity between psychedelics and NDEs may further indicate that endogenous chemicals are linked to NDEs—although such interesting cases as these do not *per se* explain the phenomena's ontology in terms of a strict reductionism, as these compounds themselves may evidently correlate with non-local awareness (Luke, 2017).

In Chapter 13, Greyson surveyed the more 'heavenly' of NDEs, contrasted to ones of a more 'hellish' quality. He stressed that there is no evidence illuminating why a majority of experiencers report blissful experiences whereas a minority report distressing ones. He cited, for example, that imprisoned murderers have reported ecstatic NDEs, yet mystics such as St. John of the Cross endured harrowing 'dark nights of the soul.' As mentioned, such 'dark nights' are ubiquitous in challenging psychedelic states and are tantamount to the shamanic 'ordeal' that often, as part of the death-rebirth archetype, culminates in emergence into divine grace—a sequence also often observed in distressing NDEs. The psychological *mindset* of NDErs, such as their psychological history or their state of mind just prior to the NDE, and their *setting*, such as their physical and social surroundings, may well be informative as to the valence of the experience—as may well be the internal, interoceptive state of the experiencer—as is the case with psychedelics. Greyson described, for instance, the case of Kat who, following a car crash, experienced rupture of the tissue around her liver as well as an NDE involving torturous "burning and tearing through the middle of [her] body"—which, when she cried out to God, suddenly stopped and transformed into a "peace that transcends all understanding" (p. 145). Such 'supernatural rescues,' common in distressing NDEs, are arguably related to endorphin release, and are also reminiscent—albeit in reverse—of reports of administration of naloxone, the opioid receptor antagonist, converting pleasurable NDEs into distressing ones (Judson & Wiltshaw, 1983). Later, Greyson also related Jeff's experience after a motorcycle crash in which he inhaled noxious gas fumes. He described that his hospital experience included being "tortured by beings with eyes . . . strapping him to a table . . . inserting needles into his body . . . tormented either by demons or aliens" (p. 150), which sounds remarkably like some DMT reports in Strassman's (2001) original studies in a clinical environment—again illustrating the effect of set and setting when in an altered state of consciousness.

In Chapter 14, Greyson focused on the encounter phenomenon,

such as with God or other divine beings. He found that up to two-thirds of NDEs actually involve encounters that are unidentifiable, that is, either ambiguous or inconsistent with the person's previous belief or understanding. The possible meetings with beings from entirely unknown cosmologies is again redolent of many psychedelic reports, often DMT, though Grof (1985) also recounted some during LSD psychotherapy. As such, psychedelic trips and NDEs alike may similarly be capable of presenting imagery from collective, not purely personal, unconscious archetypal layers of mind. Although the entities may be labelled in any manner of terms according to the experiencer's interpretations, Greyson highlighted that the crucial point is the effect these beings have on experiencers, engendering feelings of calm, being at home, or love. As demonstrated in my own research, entities met on DMT might have a staggering repertoire of identities, but their functions are universally meaningful, and may be likewise ones of reassurance, welcoming, or benevolence (Michael et al., 2021). Whereas Greyson pointed out that 90% of NDEs incorporate otherworldly rendezvous with divine or godlike beings, such encounters are also more common than not with high-dose breakthrough DMT trips—with almost 60% exhibiting benevolent or positive roles (Michael et al., 2021). Davis et al. (2020), for instance, explicitly surveyed this phenomenon with DMT, underscoring the existentially and psychologically transformative influence it exerts—mirroring Greyson's words that these encounters are among the most profound aspects of NDEs, alongside their ongoing impact on experiencers' lives.

In the next chapter, Greyson elaborated on these transformations, including those that have transpired following suicide-related NDEs. He described being stunned about the resultant, “paradoxical” decreased suicidal ideation, given that NDEs typically lead to more positive attitudes about death. However, ironically, his train of thought does not account for how NDEs lead to less suffering and, therefore, less desire to die at all. It is clearly reminiscent of the therapeutic effects of psychedelic agents, as shown in a now-exponentially growing number of clinical studies. Specifically, both ketamine, and possibly ayahuasca, have been shown to have anti-suicidal properties (Siegel et al., 2021; Zeifman et al., 2019)—and both of which, interestingly, are highly phenomenologically resonant with NDEs (Liestner, 2013; Martial et al., 2019). When Greyson interviewed suicide NDErs as to why their motivation to commit suicide changed, they offered answers such as their now feeling part of something greater than themselves, their increased valuation of themselves for who they are, and their greater

sense of being interconnected with others—all remarkably echoing of patients’ accounts of increased connection to the world, themselves, and other people, respectively, after psilocybin therapy for depression (Watts et al., 2017). In a similar vein, one of Greyson’s studies showing a maintained level of improvements occurring post-NDE and 20 years afterward with regard to attitudes toward death, sense of spirituality, sense of meaning, and feelings toward the self and others is consistent with recent follow-ups up to almost five years after psilocybin treatment for end-of-life existential distress that showed sustained reduction in death anxiety and hopelessness and increase in spiritual wellbeing (Agin-Liebes et al., 2020). In this way, the release of similar neurotransmitters, with similar therapeutic capacities as the medicines acting upon such systems, may well be a substrate of NDEs. This said, such a dramatic clinical improvement after a matter of hours of a psychedelic trip may be understandable, whereas such transformations occasioned after NDEs that lasted only minutes at most—at least in objective time—is perhaps one of the most staggering dimensions of the NDE phenomenon.

In Chapter 16, Naomi’s experience of the world after her NDE furnishes these insights into the mutually evocative transformative potential of both these and psychedelic states. She said,

Everything in the environment took on an almost magical quality . . . Trees and flowers blossoming took on new dimensions . . . I almost felt as if I was on a *chemically induced high*. I will certainly never take being alive again for granted (p. 180, italics added)

Such descriptions are virtually identical to the so-called ‘afterglow’ following psychedelic experiences, whereby the sense of enhanced well-being remains after the acute effects dissipate, including increased capacity for mindfulness and psychological flexibility (Murphy-Beiner & Soar, 2020). However, just as with these substances, such boons are typically not as sustained if the experience is not properly approached after the fact, that is, the well-known concept in psychedelic therapy of ‘integration’; indeed, I elsewhere discuss how therapists working with NDErs should adopt this concept and practice from the field of psychedelic psychotherapy (Michael, 2022). This same dynamic is articulated by Fran, reflecting after her NDE that

the moment comes when the experience ceases to be the focal point. You have to really look upon it as . . . a new birth . . . This time the growth is a new reality; it points you to becoming involved with others. The self dwindles away . . . Over and above the talking about it

... has to then come the *action* ... the action of doing what we were sent back for. (pp. 184–185)

In Chapter 18, Greyson explored the opposite experiences of some NDErs in which flying so high into the celestial light was followed by a painful fall back into worldly existence, illustrating a type of case in which the need for integration is particularly acute. Cecilia put her new-found existential angst succinctly, angrily asking God “Why am I alive!” Lynn viscerally described her feelings of her ‘hard landing’:

I have always felt like, ‘Thanks a lot; why couldn’t you have just told me a little bit more, or nothing at all?’ It really took me some time to adjust emotionally to the fact that when you die, you don’t just stop existing. It really got to me. (p. 196)

This reaction demonstrates ontological shock, a potentially traumatic consequence of experiences that deeply challenge one’s previous frameworks for understanding the world. Such ontological shifts are, again, exhibited after deep psychedelic episodes as well as encounters with ostensibly otherworldly and other-than-self sentient agents during DMT experiences (Davis et al., 2020; see also Supplementary Material in Michael et al., under review-c), whereby a small minority also endorse that the experience had undesirable psychospiritual consequences.

In the penultimate Chapter 19, adopting a more wide-angle lens to reflect on the more metaphysical implications of the preceding sections, Greyson first referred to Newberg’s neuroimaging research on Franciscan nuns as they prayed. When Newberg presented his colleagues with the resultant activated brain areas, they responded these must be the spots which “make them think they’re talking with God,” whereas the nuns’ rejoinder was that they were rather the spots that “God uses to talk to me,” which confirmed for them that humans are biologically “hardwired for God” (p. 210). Whereas the former interpretation is representative of the more reductionist ‘neurotheological’ paradigm, the latter interpretation can be regarded as a ‘theoneurological’ twist (Strassman, 2014), a neologism Strassman created to refer to DMT being historically implicated in divine prophecy. In this way, even if the neural substrates of NDEs and psychedelic experiences may largely overlap, neither experience is reduced to a physicalist account *per se*, as proponents of the ‘transmission’ theory—that the brain is a transmitter rather than producer of consciousness—may leverage the same data toward dualist- or idealist-type models. The nuns’ appraisal that the brain may be evolutionarily configured for



divine experience is also echoed by findings that God-encounters that happened naturally—‘authentically,’ possibly including NDEs—are virtually indistinguishable from those that occurred under the influence of classical psychedelics (Griffiths et al., 2019).

In the final chapter, Greyson took readers on a concluding tour of all the lessons he had previously presented about NDEs. As already mentioned, I consider his statements to be possibly premature that other than some form of dualism he subtly espoused, he does not “have any alternative explanation for the evidence” (p. 220) of veridical perception—including Peak in Darien reports—or of clear consciousness during brain impairment. Although, regarding the former, such non-local observations have led some NDE researchers to posit a survivalist interpretation (e.g. van Lommel, 2013), these effects may themselves be mediated by terminal neural activity and as such may possibly be transient. Peak in Darien instances are provocative, especially in cases in which the experiencer is the *first* to know of the encountered deceased’s death, thus undermining the ‘super-psi’ hypotheses of deriving the information by allegedly extrasensory means. But in light of Greyson’s report that 70% of NDEs involve perceiving dead loved ones but 7% involve perceiving those who are still alive, the statistical likelihood of a chance meeting with someone unknown to be dead requires further scrutiny. As regards Greyson’s latter statement regarding the ‘paradox’ of lucidity in a dying brain, in this article I have discussed at length its possible neural mediation via endogenous compounds with specific cognitive corollaries, including psychedelic agents which elevate entropy indexing enriched conscious states (Scott & Carhart-Harris, 2019)—or, indeed, damage to the brain itself may also converge on similar states via the disinhibition of intrinsic activity (Michael et al., under review-b).

With much obsession around NDEs being centered on the question of life after death, Greyson poignantly tied up his book with the contemplation of NDEs being, rather, about life *before* death—especially about transformation within the parameters of this Earthly life: that the only fact anyone can reasonably accept is that “we are here *now*” and that in reducing fear of death, NDEs also paradoxically—or *not so* paradoxically—reduce the fear of living, enabling one to “live more fully in the present” (pp. 216–218). Indeed, not only have NDEs been linked to enhanced mindfulness (Bianco, 2017) but so have psychedelics (e.g., Murphy-Beiner & Soar, 2020), with this sharpened present-mindedness also correlating with diminishment in death anxiety as measured consciously and unconsciously. In Muraresku’s (2020) argu-

ments for psychedelic-like sacrament use in pre-history and antiquity, possibly as progenitors of contemporary religions, he quoted the inscription at the Greek Orthodox monastery in Mt. Athos, Greece: “If you die before you die, you won’t die when you die.” The priest Praetextatus, when supplicating emperor Valentinian who had threatened to abolish the ancient Greek Eleusinian mysteries—incorporating the ritual drink of the, potentially psychedelic, *kukeon*—he asserted that without it, life would become *ἀβίωτος*, that is, “unliveable.” Echoing NDE rebirth then, these virtual ‘near-death’ experiences are also potent instruments in awakening to the blaze of sensorial experience; prior to this experience a person may be equivalent to someone who is asleep—or, indeed, not truly alive.

## Conclusions

In conclusion, although in the present article I offer a more naturalistic explication of NDEs, I also attempted to maintain an ontologically non-partisan approach. For instance, even if NDEs are akin to intrinsic psychedelic experiences, psychedelic states themselves are highly prone to presenting their own challenging implications of a potentially transpersonal nature (e.g. Luke, 2017; Luke & Spowers, 2022; Luke & Spowers, 2018). In addition, the case reports of NDEs that Greyson thoughtfully wove throughout *After* are, more often than not, tremendously profound, and the content often highly specific; thus, it may be promissory science to claim that neuroscientists will provide a sufficient explanation once they secure a sufficient understanding of the brain. For instance, although it has been suggested there may be a heritable predisposition to NDEs due to conferring survival advantage by promoting prosocial behavior (Lake, 2019), which may in turn be partly owing to the relational dimension to the life review, the life review, itself an exceedingly multifaceted component, may not be neurally reducible. In Tom Sawyer’s NDE, for example, he relived episodes of his life with pristine fidelity from the perspective of *others*, such as a certain reckless driver that he had beaten up:

In the life review, I came to know that he was in a drunken state . . . in a severe state of bereavement for his deceased wife . . . I saw the stool in the bar where he had his drinks. I also experienced Tom’s fist come directly into my face. And I felt the indignation, the rage, the embarrassment... *I was in that man’s body, seeing through that man’s eyes...* You better believe that I was in that man’s eyes. (Greyson, 2021, p. 183)

In similar a vein, ‘the return’ back to life possesses features that are difficult to explain exclusively in terms of neuropsychological processes. Although some authors have suggested the message often communicated that it is ‘not your time’ represents the dying mind’s harnessing of the unconscious to provide a drive for or feasibility of survival, presumably via some psychosomatic suggestion (Jansen, 1997), in numerous instances the NDEr was presented with the opportunity to decide either to *stay* or to return, such as the case with Edith:

This is a place of total love . . . where ultimate security exists, forever. From somewhere within the light I felt the presence of another . . . It was certainly not human . . . a voice said, ‘You are safe here’ . . . then [it] said that I could stay there forever, or I could return to my body and go on with my life; it was my decision. (Greyson, 2021, p. 198)

Finally, it cannot be doubted that Greyson has authored a comprehensive, enlightening, and clear encapsulation of the progress of the field of near-death studies—which he was instrumental in developing. However, there appear to have been explanatory gaps for which he may have prematurely declared not to have explanations, despite a wealth of literature, predominantly from the psychedelic sciences, possibly able to breach said anomalies. I believe that if these sources were duly considered, they would help to construct a more fruitful and wholistic paradigm and, thereby, would provide an even greater illumination of this fascinating phenomenon that Greyson has already achieved.

## References

- Agin-Liebes, G. I., Malone, T., Yalch, M. M., Mennenga, S. E., Ponté, K. L., Guss, J., Bossis, A. P., Grigsby, J., Fischer, S., & Ross, S. (2020). Long-term follow-up of psilocybin-assisted psychotherapy for psychiatric and existential distress in patients with life-threatening cancer. *Journal of Psychopharmacology*, *34*(2), 155–166. <https://doi.org/10.1177/0269881119897615>
- Bianco, S. (2017). *Living the death: Death attitudes and representations after a near-death experience* [Doctoral dissertation, University of Padova]. [https://www.research.unipd.it/retrieve/handle/11577/3422272/569748/Tesi\\_Finale\\_-\\_Simone\\_Bianco.pdf](https://www.research.unipd.it/retrieve/handle/11577/3422272/569748/Tesi_Finale_-_Simone_Bianco.pdf)
- Blanke, O., Faivre, N., & Dieguez, S. (2015). Leaving body and life behind: Out-of-body and near-death experience. In S. Lauries, O. Gosseries, & G. Tononi (Eds.), *The neurology of consciousness: Cognitive neuroscience and neuropathology* (pp. 323–348). Elsevier.
- Blom, J. D. (2021). Leroy’s elusive little people: A systematic review on lilliputi-

- tian hallucinations. *Neuroscience and Biobehavioral Reviews*, *125*, 627–636. <https://doi.org/10.1016/j.neubiorev.2021.03.002>
- Braude, S. E. (2003). *Immortal remains: The evidence for life after death*. Rowman & Littlefield.
- Britton, W. B., & Bootzin, R. R. (2004). Near-death experiences and the temporal lobe. *Psychological Science*, *15*(4), 254–258. <https://doi.org/10.1111/j.0956-7976.2004.00661.x>
- Buchborn, T. (2019). Using optogenetics to shine a light on the motor-cortical embedding of the mammalian “psychedelic signature move.” Retrieved from <https://www.youtube.com/watch?v=iw4-Q1BmLzs>
- Cahill, L., & Alkire, M. T. (2003). Epinephrine enhancement of human memory consolidation: Interaction with arousal at encoding. *Neurobiology of Learning and Memory*, *79*(2), 194–198. [https://doi.org/10.1016/S1074-7427\(02\)00036-9](https://doi.org/10.1016/S1074-7427(02)00036-9)
- Carhart-Harris, R. (2007). Waves of the unconscious: The neurophysiology of dreamlike phenomena and its implications for the psychodynamic model of the mind. *Neuropsychoanalysis*, *9*(2), 183–211. <https://doi.org/10.1080/15294145.2007.10773557>
- Carhart-Harris, R. L., & Friston, K. J. (2019). REBUS and the anarchic brain: Toward a unified model of the brain action of psychedelics. *Pharmacological Reviews*, *71*(3), 316–344. <https://doi.org/10.1124/pr.118.017160>
- Carhart-Harris, R. L., Erritzoe, D., Haijen, E., Kaelen, M., & Watts, R. (2018). Psychedelics and connectedness. *Psychopharmacology*, *235*, 547–550. <https://doi.org/10.1007/s00213-017-4701-y>
- Carhart-Harris, Robin L. (2018). The entropic brain - revisited. *Neuropharmacology*, *142*, 167–178. <https://doi.org/10.1016/j.neuropharm.2018.03.010>
- Carhart-Harris, Robin L., Leech, R., Hellyer, P. J., Shanahan, M., Feilding, A., Tagliazucchi, E., Chialvo, D. R., & Nutt, D. (2014). The entropic brain: A theory of conscious states informed by neuroimaging research with psychedelic drugs. *Frontiers in Human Neuroscience*, *8*, 1–22. <https://doi.org/10.3389/fnhum.2014.00020>
- Carhart-Harris, R. L., Muthukumaraswamy, S., Roseman, L., Kaelen, M., Droog, W., Murphy, K., Tagliazucchi, E., Schenberg, E. E., Nest, T., Orban, C., Leech, R., Williams, L. T., Williams, T. M., Bolstridge, M., Sessa, B., McGonigle, J., Sereno, M. I., Nichols, D., Hellyer, P. J., ... Nutt, D. J. (2016). Neural correlates of the LSD experience revealed by multimodal neuroimaging. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(17), 4853–4858. <https://doi.org/10.1073/pnas.1518377113>
- Charland-Verville, V., Jourdan, J. P., Thonnard, M., Ledoux, D., Donneau, A. F., Quertemont, E., & Laureys, S. (2014). Near-death experiences in non-life-threatening events and coma of different etiologies. *Frontiers in Human Neuroscience*, *8*. <https://doi.org/10.3389/fnhum.2014.00203>
- Corazza, O. (2008). *Near-death experiences: Exploring the mind-body connection*. Routledge.
- Cott, C., & Rock, A. (2008). Phenomenology of N,N-Dimethyltryptamine use: A thematic analysis. *Journal of Scientific Exploration*, *22*(3), 359–370.
- Davis, A. K., Clifton, J. M., Weaver, E. G., Hurwitz, E. S., Johnson, M. W., & Griffiths, R. R. (2020). Survey of entity encounter experiences occasioned by inhaled N,N-dimethyltryptamine: Phenomenology, interpretation, and endur-

- ing effects. *Journal of Psychopharmacology*, *34*(9), 1008–1020. <https://doi.org/10.1177/0269881120916143>
- Dean, J. G., Liu, T., Huff, S., Sheler, B., Barker, S. A., Strassman, R. J., Wang, M. M., & Borjigin, J. (2019). Biosynthesis and extracellular concentrations of N,N-dimethyltryptamine (DMT) in mammalian brain. *Scientific Reports*, *9*(1), 1–11. <https://doi.org/10.1038/s41598-019-45812-w>
- Gosseries, O., & Martial, C. (2020). The use of psychedelics in the treatment of disorders of consciousness. *Alius Bulletin*, *4*. [https://www.researchgate.net/publication/348182881\\_The\\_Use\\_of\\_Psychedelics\\_in\\_the\\_Treatment\\_of\\_Disorders\\_of\\_Consciousness](https://www.researchgate.net/publication/348182881_The_Use_of_Psychedelics_in_the_Treatment_of_Disorders_of_Consciousness)
- Greyson, B. (1983). The Near-Death Experience Scale: Construction, reliability, and validity. *Journal of Nervous and Mental Disease*, *171*(6), 369–375.
- Greyson, B. (2021). *After: A doctor explores what near-death experiences reveal about life and beyond*. St. Martin's Essentials.
- Greyson, B. (2003). Near-death experiences in a psychiatric outpatient clinic population. *Psychiatric Services*, *54*(12), 1649–1651. <https://doi.org/10.1176/appi.ps.54.12.1649>
- Griffiths, R. R., Hurwitz, E. S., Davis, A. K., Johnson, M. W., & Jesse, R. (2019). Survey of subjective “God encounter experiences”: Comparisons among naturally occurring experiences and those occasioned by the classic psychedelics psilocybin, LSD, ayahuasca, or DMT. *PLoS ONE*, *14*(4). <https://doi.org/10.1371/journal.pone.0214377>
- Grof, S. (1994). Alternative cosmologies and altered states. *Noetic Sciences Review*, *32*, 21.
- Grof, S. (1985). *Beyond the brain: Birth, death, and transcendence in psychotherapy*. State University of New York Press.
- Jansen, K. (2000). *Ketamine: Dreams and realities*. Multidisciplinary Association for Psychedelic Studies.
- Jansen, K. L. R. (1997). Response to commentaries on “The Ketamine Model of the Near-Death Experience . . .” *Journal of Near-Death Studies*, *16*(1). <https://doi.org/10.17514/JNDS-1997-16-1-p79-95>.
- Judson, I., & Wiltshaw, E. (1983). A near-death experience. *Lancet*, *322*(8349), 561–562.
- Khanna, S., Moore, L. E., & Greyson, B. (2018). Full neurological recovery from escherichia coli meningitis associated with near-death experience. *Journal of Nervous and Mental Disease*, *206*(9), 744–747. <https://doi.org/10.1097/NMD.0000000000000874>
- Kuc, J., Kettner, H., Rosas, F., Erritzoe, D., Haijen, E., Kaelen, M., Nutt, D., & Carhart-Harris, R. L. (2022). Psychedelic experience dose-dependently modulated by cannabis: Results of a prospective online survey. *Psychopharmacology*, *239*(5), 1425–1440.
- Lake, J. (2019). The near-death experience (NDE) as an inherited predisposition: Possible genetic, epigenetic, neural and symbolic mechanisms. *Medical Hypotheses*, *126*, 135–148. <https://doi.org/10.1016/j.mehy.2019.03.016>
- Lebedev, A. V., Lövdén, M., Rosenthal, G., Feilding, A., Nutt, D. J., & Carhart-Harris, R. L. (2015). Finding the self by losing the self: Neural correlates of ego-dissolution under psilocybin. *Human Brain Mapping*, *36*(8), 3137–3153. <https://doi.org/10.1002/HBM.22833>
- Li, D., Mabrouk, O. S., Liu, T., Tian, F., Xu, G., Rengifo, S., Choi, S. J., Ma-

- thur, A., Crooks, C. P., Kennedy, R. T., Wang, M. M., Ghanbari, H., & Borjigin, J. (2015). Asphyxia-activated corticocardiac signaling accelerates onset of cardiac arrest. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(16), E2073–E2082. <https://doi.org/10.1073/pnas.1423936112>
- Liester, M. B. (2013). Near-death experiences and ayahuasca-induced experiences—Two unique pathways to a phenomenologically similar state of consciousness. *Journal of Transpersonal Psychology*, *45*(1), 24–48.
- Loseu, S., Holden, J. M., Kinsey, L., & Christian, R. (2013). The field of near-death studies through 2011: An updated analysis of the scholarly periodical literature. *Journal of Near-Death Studies*, *31*, 189–202. <https://doi.org/10.17514/JNDS-2013-31-4-p189-202>.
- Luke, D., & Spowers, R. (2022). *DMT entity encounters: Dialogues on the spirit molecule*. Park Street Press.
- Luke, D. (2011). Discarnate entities and dimethyltryptamine (DMT): Psychopharmacology, phenomenology and ontology. *Journal of the American Society for Psychical Research*, *75*(902), 26–42.
- Luke, D. (2012). Psychoactive substances and paranormal phenomena: A comprehensive review. *International Journal of Transpersonal Studies*, *31*(1), 97–156. <https://doi.org/10.24972/ijts.2012.31.1.97>
- Luke, D. (2017). *Otherworlds: Psychedelics and exceptional human experience*. Muswell Hill Press.
- Luke, D., & Spowers, R. (Eds.). (2018). *DMT dialogues: Encounters with the spirit molecule*. Park Street Press.
- Martial, C., Cassol, H., Charland-Verville, V., Pallavicini, C., Sanz, C., Zamberlan, F., Vivot, R. M., Erowid, F., Erowid, E., Laureys, S., Greyson, B., & Tagliazucchi, E. (2019). Neurochemical models of near-death experiences: A large-scale study based on the semantic similarity of written reports. *Consciousness and Cognition*, *69*, 52–69. <https://doi.org/10.1016/j.concog.2019.01.011>
- Mediano, P. A. M., Rosas, F. E., Timmermann, C., Roseman, L., Nutt, D. J., Feilding, A., Kaelen, M., Kringelbach, M. L., Barrett, A. B., Seth, A. K., Muthukumaraswamy, S., Bor, D., & Carhart-Harris, R. L. (2020). Effects of external stimulation on psychedelic state neurodynamics. *bioRxiv* 2020.11.01.356071. <https://doi.org/10.1101/2020.11.01.356071>
- Michael, P. (2022). Thanatotherapy: How psychedelic-assisted psychotherapy and the near-death experience can mutually benefit one another. *Psychotherapy Section Review, British Psychological Association*, *67*, 99–108.
- Michael, P., Luke, D., & Robinson, O. (2021). An encounter with the other: A thematic and content analysis of DMT experiences from a naturalistic field study. *Frontiers in Psychology*, *12*, 1–20. <https://doi.org/10.3389/fpsyg.2021.720717>
- Michael, P., Luke, D., & Robinson, O. (under review-a). *An encounter with death: Comparative thematic analyses of the DMT experience and the near-death experience*.
- Michael, P., Luke, D., & Robinson, O. (under review-b). *This is your brain on death: A comparative analysis of a near-death experience and subsequent 5-methoxy-DMT experience*.
- Michael, P., Luke, D., & Robinson, O. (under review-c). *An encounter with the self: A thematic and content analysis of the DMT experience from a naturalistic field study*.



- Muraresku, B. C. (2020). *The immortality key: The secret history of the religion with no name*. St Martin's.
- Murphy-Beiner, A., & Soar, K. (2020). Ayahuasca's 'afterglow': Improved mindfulness and cognitive flexibility in ayahuasca drinkers. *Psychopharmacology*, 237(4), 1161–1169. <https://doi.org/10.1007/s00213-019-05445-3>
- Muthukumaraswamy, S. D., Carhart-Harris, R. L., Moran, R. J., Brookes, M. J., Williams, T. M., Erntzoe, D., Sessa, B., Papadopoulos, A., Bolstridge, M., Singh, K. D., Feilding, A., Friston, K. J., & Nutt, D. J. (2013). Broadband cortical desynchronization underlies the human psychedelic state. *Journal of Neuroscience*, 33(38), 15171–15183. <https://doi.org/10.1523/JNEUROSCI.2063-13.2013>
- Palmieri, A., Calvo, V., Kleinbub, J. R., Meconi, F., Marangoni, M., Barilaro, P., Broggio, A., Sambin, M., & Sessa, P. (2014). "Reality" of near-death-experience memories: Evidence from a psychodynamic and electrophysiological integrated study. *Frontiers in Human Neuroscience*, 8, 1–16. <https://doi.org/10.3389/fnhum.2014.00429>
- Scarpelli, S., Bartolacci, C., D'Atri, A., Gorgoni, M., & De Gennaro, L. (2019). The functional role of dreaming in emotional processes. *Frontiers in Psychology*, 10, 459. <https://doi.org/10.3389/fpsyg.2019.00459>
- Schindler, E. A. D., Wallace, R. M., Slosower, J. A., & D'Souza, D. C. (2018). Neuroendocrine associations underlying the persistent therapeutic effects of classic serotonergic psychedelics. *Frontiers in Pharmacology*, 9, 1–16. <https://doi.org/10.3389/fphar.2018.00177>
- Schmid, C. L., & Bohn, L. M. (2010). Serotonin, but not N-methyltryptamines, activates the serotonin 2A receptor via a  $\beta$ -arrestin2/Src/Akt signaling complex in vivo. *Journal of Neuroscience*, 30(40), 13513–13524.
- Scott, G., & Carhart-Harris, R. L. (2019). Psychedelics as a treatment for disorders of consciousness. *Neuroscience of Consciousness*, 2019(1), 1–8. <https://doi.org/10.1093/nc/niz003>
- Seth, A. K., Barrett, A. B., & Barnett, L. (2011). Causal density and integrated information as measures of conscious level. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 369 (1952), 3748–3767. <https://doi.org/10.1098/RSTA.2011.0079>
- Siegel, A. N., Di Vincenzo, J. D., Brietzke, E., Gill, H., Rodrigues, N. B., Lui, L. M. W., Teopiz, K. M., Ng, J., Ho, R., McIntyre, R. S., & Rosenblat, J. D. (2021). Antisuicidal and antidepressant effects of ketamine and esketamine in patients with baseline suicidality: A systematic review. *Journal of Psychiatric Research*, 137, 426–436. <https://doi.org/10.1016/j.jpsychires.2021.03.009>
- Strassman, R. (2014). *DMT and the soul of prophecy: A new science of spiritual revelation in the Hebrew Bible*. Simon and Schuster.
- Strassman, R. (2001). *DMT: The spirit molecule: A doctor's revolutionary research into the biology of near-death and mystical experiences*. Park Street Press.
- Tagliazucchi, E., Roseman, L., Kaelen, M., Orban, C., Muthukumaraswamy, S. D., Murphy, K., Laufs, H., Leech, R., McGonigle, J., Crossley, N., Bullmore, E., Williams, T., Bolstridge, M., Feilding, A., Nutt, D. J., & Carhart-Harris, R. (2016). Increased global functional connectivity correlates with LSD-induced ego dissolution. *Current Biology*, 26(8), 1043–1050. <https://doi.org/10.1016/J.CUB.2016.02.010>



- Timmermann, C. (2019, June 4). The neuroscience of DMT: Imperial College Research. Paper presented at *The Experimental Thought Co.*, Juju's Bar, London, UK.
- Timmermann, C., Roseman, L., Williams, L., Erritzoe, D., Martial, C., Cassol, H., Laureys, S., Nutt, D., & Carhart-Harris, R. (2018). DMT models the near-death experience. *Frontiers in Psychology, 9*, 1–12. <https://doi.org/10.3389/fpsyg.2018.01424>
- van Lommel, P. (2013). Non-local consciousness: A concept based on scientific research on near-death experiences during cardiac arrest. *Journal of Consciousness Studies, 20*(1–2), 7–48.
- Watts, R., Day, C., Krzanowski, J., Nutt, D., & Carhart-Harris, R. (2017). Patients' accounts of increased "connectedness" and "acceptance" after psilocybin for treatment-resistant depression. *Journal of Humanistic Psychology, 57*(5), 520–564. <https://doi.org/10.1177/0022167817709585>
- Winkelman, M. (2002). Shamanism as neurotheology and evolutionary psychology. *American Behavioral Scientist, 45*(12), 1875–1887.
- Winkelman, M. (2010). *Shamanism: A biopsychosocial paradigm of consciousness and healing*. Praeger/ABC-CLIO.
- Zeifman, R. J., Palhano-Fontes, F., Hallak, J., Arcoverde, E., Maia-Oliveira, J. P., & Araujo, D. B. (2019). The impact of ayahuasca on suicidality: Results from a randomized controlled trial. *Frontiers in Pharmacology, 10*, 1–10. <https://doi.org/10.3389/fphar.2019.01325>