



On Thinking

*An Introspective View Into The Symbology Behind Duality In Our
Minds*

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LEGIBLE TRACES

Dedicated to the Prophets who showed us the way, and the Great Scientists who measured the distance. To the healers on both sides of the line, and to the influences we can and can't see. May we as humans always strive to put the darkness in our pasts, so we can look towards a brighter future. To the thinkers, the ones who exist inside and outside the box, who are one in the same.

ABSTRACT

A philosophy-of-mind reflection on duality. It argues that science and religion, fractal and mandala, analysis and intuition are not opposites but two *attentions* turned upon one world — and that the felt task of "seeing whole" corresponds, at least by metaphor and at most by measurable correlation, to the integration of the brain's two hemispheres across the corpus callosum. Drawing on split-brain research, hemispheric asymmetry, the fractal aesthetic, Jungian psychology (Persona, Ego, Self, and individuation; the mandala as a symbol of wholeness), the pineal gland as Descartes's "seat of the soul" and a symbol of the balancing Ego — including the surprising recent neuroscience of endogenous DMT and the dying brain — and the neuroscience of ego-dissolution, the essay holds a deliberate seam between empirical finding and symbolic interpretation, and closes on the quieting of the self-narrating mind as a path to balance and inner peace.

KEYWORDS

duality; hemispheric lateralization; corpus callosum; interhemispheric integration; split-brain; left-hemisphere interpreter; fractal aesthetics; mandala symbolism; Carl Jung; Persona; Ego; Self; individuation; pineal gland; Descartes; seat of the soul; third eye; endogenous DMT; near-death experience; default mode network; ego dissolution; neurotheology; philosophy of mind; science and religion.

Sometimes when I sit, and I have nothing left to think about, I think about thinking.

I consider what the reader might think from reading this, the very sound of the words coming from my lips as I read it aloud sounds pretentious. But sometimes, the importance of thought comes not from the Ego, but from the Self.

So I will proceed with my "theories" about life, and let's see where they go.

Shortly after my meditational (physical and metaphysical) experience I had the unconventional idea that I could "blend science and faith." This, I imagine, is a common feeling from people who have had the same. Every experience from NDE's to voluntary meditational alignment, like myself.

My self. Here we go again, there exists no ego in thought. The Self is not mine to own; the "my" is the filter through which I speak, and the Persona I maintain is what will allow or prevent the reader from absorbing what I say. Measured, this depends on the variance between their Persona and their Ego, for the Self is the same. Hold onto those three words — Persona, Ego, Self. They come back later, and when they do they will have an address in the brain.

I digress, and this is an important topic to me, so I must stay aligned as I write. In the endless pursuit of the truth, I will only edit what is necessary to deliver facts, and ponder on the many ways they are connected in a duality sense.

For instance, when I speak of science and religion. It would seem to me, two different explanations of the same thing. The Priest and the Physicist, as I have touched on before. Both wanting to help fellow man, both having different methodology for doing so.

There is a piece of the brain that does exactly this for a living. When the two halves of the mind are surgically divided, the left half keeps

narrating anyway — it will invent a reason for what the right half just did, confidently, out of nothing, because explaining is simply what it does. Gazzaniga called it the *interpreter*.¹ The priest and the physicist are, in that light, the same faculty turned toward the same mystery: two explanations, one thing being explained. The people who study these two ways of knowing even give the duality a shape. Some, like Gould, keep them apart on purpose — separate magisteria, one asking *how*, the other asking *why*, each sovereign in its own country. Others, like Barbour, let them meet — two sets of models reaching toward one reality that neither can hold alone.² Independence or integration. Which is to say: the same duality I keep finding everywhere. Held apart, and secretly one.

I would imagine a similar meditational experience for those individuals being vastly different. I imagine the priest would see mandalas, and the scientist would see fractals. But in reality, both would be perceptions of the same thing.

And here is the part I love. Look at them one way and they *are* opposites. The mandala is round, blooming, petaled — a flower of the mind. The fractal is angular, branching, crystalline — geometry with its edges showing. One is the rose; the other is the lattice. But that is the *seeing*, not the *thing*. Measure the mandala — the stone bones of a Hindu temple, the geometry beneath a Gothic rose window — and you find it built out of the fractal: the same self-similar nesting, squares within squares, circles within circles, each smaller one born from the center of the last.³ The round thing is made of the angular thing. The priest's flower and the scientist's lattice are one object under two attentions — one that rounds the world into wholes, one that cuts it into repeating parts. Which is, as it happens, a fair description of the two halves of a human head.⁴

And the eye already knows this. Show a person fractal patterns tuned to the roughness of a coastline or the branching of a fern — a middle range of complexity, neither too bare nor too busy — and nearly every

human being tested, across cultures, calls them beautiful. Taylor's group found the body agrees: measured stress drops just from looking.⁵ The scientist measured that pattern. The priest was moved by it. Jung, for his part, watched the mandala rise unbidden in his patients' dreams whenever a psyche was trying to make itself whole again, and named it the symbol of the Self.⁶ Same thing, seen from two seats.

Very much in the way a flower sits next to bismuth. Both showing the quality of growth and life, but managed to stem from very different substrates.

Notice they even fall on the two sides. The flower is the round one — organic, petaled, the mandala's cousin. The bismuth is the angular one — stair-stepped terraces, each ledge echoing the larger, the fractal's cousin, looking alive though it never lived. And yet they grow by the same rule: the petals spiral in the counts the mathematicians love, the metal stacks itself in self-similar steps. Different substrates, one grammar of growth. And if you follow the substrate all the way down, the flower and the metal were both cooked in the furnaces of dying stars. Does the flower not bloom like the bismuth from the same stars that forged us both?

Magnets, as I have discussed before. Only exist to balance themselves, so to speak — countless small domains swinging into agreement, coherence made visible. Our observation of them must be very similar to how a Creator would perceive us, watching us oscillate back and forth between coherence and not.

Darkness is balanced by light. Fractalize that statement, and you have the plot of any successful movie or book series, where the hero overcomes evil — the same arc repeating at every scale of every story. Again, I consider, we create within the design, and therefore create with the same rules with which we were created. Recursion. All the way up, and all the way down.

Batteries...need I say more?

I have always had this thought. When I was a child there existed "fact" that now stands as a myth: the creative and logic halves of the brain. A smaller part of me has still always held this to be true — more analytical people use one half. That has, for the majority of my life, been me. I can't deny it.

And the honest thing to say is that the childhood fact really did become a myth. Put a thousand people in a scanner and you will not find "left-brained" and "right-brained" persons; no one runs on half a head.⁷ The dominance story is false.

But the smaller part of me that held on wasn't wrong. It was only pointing at the wrong thing. The halves are not two personalities. They are two *ways of paying attention*. One attends narrowly — takes things apart, handles the piece in isolation, is very good with the word and the tool. The other attends widely — holds the whole in its living context, is very good with the face, the music, the room.⁴ The asymmetry is real. It was only ever the *personality* that was invented.

And now those three words come back. Persona, Ego, Self — Jung's three faces — may not be free-floating ideas at all. There is a seam in the brain they seem to lie along. The left hemisphere, home of the interpreter, is the one that speaks, that narrates, that presents a face to the world in language — which is very nearly the definition of the Persona, and the everyday seat of the "I."⁸ The right hemisphere is the quieter, wider ground — symbol, image, music, the whole-in-context, the parts of us that never learned to talk. If the unconscious has an address, this is the side researchers keep pointing to.⁹

I have to keep the seam honest, because the picture is not tidy. Ask a healthy brain to reflect on itself and it lights up on the *left* — the interpreter, narrating the self it believes it is. Damage the *right*, and the sense of self can come apart at the seams: the boundaries, the very ownership of one's own body.⁸ Which is the Jungian point exactly, if you let it be. The Ego — the narrator, the left-hand voice — is not the whole

Self. It is a face the Self wears and mistakes for the whole. The interpreter, forever confidently explaining, is the Persona convinced it is the Center. And the thing that would make it whole is not louder narration. It is the bridge.

And people have been hunting for that bridge — for the single place where the two become one — for a very long time. Descartes went looking in the 1640s and thought he'd found it in the pineal gland, a seed-sized knot near the center of the head. His reasoning is the part that stops me. Almost everything up there comes in twos, a left and a right; the pineal is single. Since the soul feels like one thing, he argued, its seat must also be one thing — one central place where the two images from the two eyes could fuse into a single picture before reaching the soul. He called it the seat of the soul.¹⁶ He was wrong about the mechanism; you cannot bottle the self in a gland, and later experiments said as much. But listen to the *shape* of the error, because it is my error too — the one this whole essay flirts with. He took the single, central thing and made it the meeting point, the "I."

And here is the rhyme that gave me chills. When the pineal fell out of fashion, the next thinker to go looking used the very same logic — *the soul is one, so its seat must be the one unpaired thing* — and landed on the corpus callosum, the bridge itself.¹⁶ The two structures I keep circling, the gland and the bridge, turn out to be history's two great guesses at a single question: where do the two halves become one?

The pineal never did wire the left to the right; the callosum does that. But it is a *balancer* after all — a keeper of proportion between opposites. It is the body's clock: it reads the light of the outer world and answers it with the chemistry of the inner one, holding day and night, waking and sleeping, in a kind of equilibrium so that neither runs away with us.¹⁷ Show each side what the other one sees, and you get balance; that is the whole of its quiet office. And reach far enough back down the line of life, and the thing was — astonishingly — an eye. A third eye: a light-sensing

organ on the top of the skull, still open in the lamprey, the tuatara, certain lizards.¹⁷ The mystics who painted an eye in the center of the forehead were not wrong about the address. They only mistook the map for the territory — the way the Ego always does.

And the gland refuses to stay small. In just the last few years, researchers found that the brain — the pineal among other places — carries the very machinery to make DMT, the most vivid vision-chemical we know of, and detected it in living brain tissue at levels in the neighborhood of serotonin itself.¹⁸ Not a drug smuggled in from outside — something the mind, apparently, brews for itself. The careful scientists are quick with the cold water, and they are right to be: the amounts are tiny, likely too faint to light the sky on their own, and the old romance that the pineal alone floods us at birth and death does not hold — the brain makes the molecule even with the gland taken out.¹⁸ But the coincidences pile up in a way a philosopher is allowed to notice aloud. Measured carefully, the DMT experience looks uncannily like what people report from the very threshold of death.¹⁹ And the dying brain, we now know, does not simply fade to black; for a moment it can *surge* — a last bright storm of the fast, organized activity that in waking life rides alongside our most vivid awareness.¹⁹ I am not going to tell you what that means; my whole posture is to ask, not answer. But I will say this: the little gland that was once an eye, that keeps the balance between our light and our dark, sits near the place where the mind keeps its own visionary chemistry. That is a great deal of symbolism for one seed of tissue to carry — whether the universe meant it or not.

So if I had to set my Ego down somewhere, I would set it there. Not because it does the uniting — the bridge does that — but because it is the one point that was never split, the still center the two sides turn around. The Persona speaks on the left. The Self waits on the right. And the Ego — single, central, holding our light and our dark in balance and calling

the whole procession "me" — is the small lamp in the middle that believes it is the one doing the seeing.

I often times wonder if the left side of the brain got separated from the right, and this wasn't our fault. We have literally seen what that separation looks like — cut the bridge of fibers between the halves, and each side carries on alone, one still speaking, one still seeing, neither quite whole.¹⁰ And there are serious thinkers who argue that our whole civilization has drifted, slowly, without anyone ever choosing it, toward the narrow attention — the taking-apart half — until we mistook it for the whole of thinking.¹¹ Not a sin. A tilt. Not our fault.

Which leaves the obvious question, the one I can't answer from where I stand: if the halves drifted apart, can the pathways between them be mapped again — deliberately, on purpose? Because that, it turns out, is what Jung was describing all along. *Individuation* — his word for becoming whole — was always the Ego making its slow peace with the unconscious it had been ignoring. Set the neuroscience beside it and the metaphor nearly embarrasses itself with how well it fits: the self we're after may be less a thing to find than a conversation to reopen, the two halves learning again to speak across the bridge.⁸

And the early facts lean that way, gently. The bridge itself — a couple hundred million fibers of it — is measurably thicker and better connected in people who have meditated for years.¹² Insight and creativity keep turning up hand in hand with the two halves talking to each other. And children gifted at mathematics turn out not to have a "math part" at all; they simply run the two halves together more cooperatively than the rest of us.¹³

I have to be honest here, because honesty is the whole point. These are correlations, not proofs. No one has yet shown that building the bridge *causes* the seeing. That is exactly the study I wish someone with a lab and a lifetime would run — and I am leaving the words for it in plain sight, so

that someone who can, might. I can only stand at the door and say: look, it's ajar.

So these days, I consider, there are other words for the opposite of analytical. Intuitive. Synthetical. The opposite of analytical was never *illogical*. The word I was reaching for all along was the *other attention* — the half that puts the world back together after the analyst has taken it apart. The happy people I mismeasured for years weren't missing logic. They were using the faculty I had let go quiet.

This makes me believe the beauty can be seen, at all times, depending on the viewpoint of the observer. Does the flower not bloom like the bismuth from the same stars that bind us to the universe?

There is nothing the pattern of life doesn't hold true to, but this is my personal understanding, my philosophy of duality, and my thoughts on... well. My thoughts. Nothing more.

Perhaps the reader will look at the stars and wonder how far their mind can reach. Perhaps they will stay here on earth, and consider the mountain's height against the depth of the ocean. Forever, and a day, it never matters.

Whatever in life you find to be beautiful, there is always going to be the opposite. But change the way we think about that opposite. Instead of illogical, let's speak of intuition. Instead of using intellect to look down on others, let's consider gifting intellect to water the flowers that exist around us in every day life. Children, for starters, for they are in fact the future. But our own personal well being is also just as important.

So, in closing, I only ask the reader this.

Look at your enemy. Ask yourself why you hate them so, and consider if there is anything you can actually do about it without bringing them harm.

Is it a family member or friend? You have some shadow work to commence, and that is yours for the undertaking.

Is it a politician or religious leader? If you are one in the same, then use your platform for change. But if you're just a normal human being like I am, find your own peace first.

People understand the difference between right and wrong. We don't have to "shout it from the mountain tops" in 2026. We coherently draw ourselves to groups that think the same way. Such is the pattern of a coherent existence.

But there is something to be said here about Samsara. Your enemy is passing through Dante's nine levels of hell; they just don't know it yet. Let them find their own way out, and don't lower yourself to the level of hate needed to join them.

I know this will seem radical to the protester. I'm not telling you what to do. I'm telling you what I did, to find internal peace.

I let it go.

And when I let it go, something in me went quiet — and it turns out the quiet has an address too. There is a network in the brain that runs the endless narration of *me*: my story, my grievances, my rank in the room. They call it the default mode network, and it runs hottest in the mind that will not stop chewing on itself — in anxiety, in rumination.¹⁴ Quiet it — through meditation, through surrender, through the plain act of letting go — and the walls of the self grow thin; people report unity, spaciousness, the boundary between self and world going soft.¹⁵ Jung would have called that the Ego loosening its grip so the Self could finally be felt. And the researchers, carefully, call it not a breakdown but a reorganization — the mind settling into a wider shape.¹⁵ Hell, quieted, from the inside.

There's nothing I can do about the world, but there's a million things I can do about my world. Infinite number of things, actually. If you think about it. Some good. Some bad.

I can go left. I can go right.

These decisions are relative to me, and me only.

Let the darkness cohere with the darkness. Let yourself walk in the path of your Self. The light.

If you feel like you're "living in hell," consider for a moment that "Hell" is in the mind, which then translates to the unified field from your perspective.

So then consider. What it must be like to be... illogically happy. What does that look like?

Probably like a flower blooming in the middle of a bunch of bismuth, I would imagine. Both one in the same.

But one cares a lot less about what it looks like to the other, I can promise you that.



NOTES

- 1 Michael S. Gazzaniga & Joseph E. LeDoux, *The Integrated Mind* (New York: Plenum, 1978); and Gazzaniga, "Cerebral specialization and interhemispheric communication," *Brain* 123, no. 7 (2000): 1293–1326. In split-brain patients the left hemisphere confabulates coherent reasons for actions it never had the information to explain.
- 2 Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999), on "Non-Overlapping Magisteria" (NOMA); and Ian G. Barbour, *When Science Meets Religion* (San Francisco: HarperSanFrancisco, 2000), whose fourfold typology (Conflict, Independence, Dialogue, Integration) and "critical realism" treat scientific and religious models as partial, revisable representations of one reality. Gould marks the Independence pole; Barbour leans toward Integration.
- 3 Iasef Md Rian, Jin-Ho Park, Hyung Uk Ahn & Dongkuk Chang, "Fractal geometry as the synthesis of Hindu cosmology in Kandariya Mahadev temple, Khajuraho," *Building and Environment* 42, no. 12 (2007): 4093–4107. Box-counting analysis shows the temple and its generative Vastu-Purusha-Mandala are self-similar across scales — a bounded mandala built from recursive, fractal structure.
- 4 Iain McGilchrist, *The Master and His Emissary: The Divided Brain and the Making of the Western World* (New Haven: Yale University Press, 2009). McGilchrist reframes the asymmetry as two *modes of attention* — the left narrow, abstracting, part-focused; the right broad, contextual, whole-focused — rather than a division of discrete functions.

- 5 Branka Spehar, Colin W. G. Clifford, Ben R. Newell & Richard P. Taylor, "Universal aesthetic of fractals," *Computers & Graphics* 27, no. 5 (2003): 813–820; and Richard P. Taylor, "Reduction of Physiological Stress Using Fractal Art and Architecture," *Leonardo* 39, no. 3 (2006): 245–251. Peak aesthetic preference clusters around a mid-range fractal dimension ($D \approx 1.3\text{--}1.5$), the range that dominates natural scenery — Taylor's "fractal fluency."
- 6 C. G. Jung, "Concerning Mandala Symbolism" and "A Study in the Process of Individuation," in *Collected Works* Vol. 9i, *The Archetypes and the Collective Unconscious* (Princeton: Princeton University Press, 1959). Jung treats the spontaneous mandala as an archetype of psychic wholeness — a symbol of the Self.
- 7 Jared A. Nielsen, Brandon A. Zielinski, Michael A. Ferguson, Janet E. Lainhart & Jeffrey S. Anderson, "An Evaluation of the Left-Brain vs. Right-Brain Hypothesis with Resting State Functional Connectivity Magnetic Resonance Imaging," *PLoS ONE* 8, no. 8 (2013): e71275. Resting-state fMRI in 1,011 subjects found lateralized *networks* but no whole-brain "dominant hemisphere" personality type.
- 8 Roberta Daini, "The Lack of Self-Consciousness in Right Brain-Damaged Patients Can Be due to a Disconnection From the Left Interpreter: The DiLeI Theory," *Frontiers in Psychology* 10 (2019): 349, doi:10.3389/fpsyg.2019.00349. Daini argues self-consciousness depends not on either hemisphere alone but on *their integration through the corpus callosum*: healthy self-reflection is left-lateralized (the interpreter), yet right-hemisphere damage produces disorders of the self (ego-boundary, body ownership) by cutting the right's contribution off from the left interpreter. *Register note*: the alignment of this seam with Jung's Ego/Persona/Self is my own interpretive analogy — the neuroscience describes the mechanism; the Jungian mapping is a philosophical reading laid over it.
- 9 On the right hemisphere as the preferential seat of unconscious, symbol-related, self-relevant processing, see "Brain Lateralization Revisited: Activity Levels and the Self-'I' Duality from a Cultural-Historical Perspective," *Human Arenas* (2026), doi:10.1007/s42087-026-00604-3, which maps a Self/"I" duality onto the hemispheres (right supporting self-relevant, unconscious meaning; left supporting language-mediated, consciously regulated sense-making). Offered as a convergent, still-developing framework, not settled fact.
- 10 Roger W. Sperry's commissurotomy studies (Nobel Prize, 1981) and Gazzaniga's split-brain experiments; reviewed in Edward H. F. de Haan et al., "Interaction in isolation: 50 years of insights from split-brain research," *Brain* 140, no. 7 (2017): 2051–2060.
- 11 McGilchrist, *The Master and His Emissary* (2009), and *The Matter With Things* (London: Perspectiva Press, 2021). *Register note*: the claim that Western culture has progressively over-privileged the left-hemisphere mode is McGilchrist's philosophical/historical

argument and is contested (see, e.g., Raymond Tallis and A. C. Grayling in *Literary Review*). It is offered here as a proposition to think with.

- 12 Eileen Luders, Kristi Clark, Katherine L. Narr & Arthur W. Toga, "Enhanced brain connectivity in long-term meditation practitioners," *NeuroImage* 57, no. 4 (2011): 1308–1316; and Luders et al., "Bridging the hemispheres in meditation: thicker callosal regions and enhanced fractional anisotropy in long-term practitioners," *NeuroImage* 61, no. 1 (2012): 181–187. Cross-sectional (correlational) findings; causation is not established.
- 13 Harnam Singh & Michael W. O'Boyle, "Interhemispheric Interaction During Global-Local Processing in Mathematically Gifted Adolescents, Average-Ability Youth, and College Students," *Neuropsychology* 18, no. 2 (2004): 371–377. Math-gifted adolescents showed enhanced interhemispheric *cooperation* rather than a localized "math module."
- 14 Marcus E. Raichle et al., "A default mode of brain function," *Proceedings of the National Academy of Sciences* 98, no. 2 (2001): 676–682; and Judson A. Brewer et al., "Meditation experience is associated with differences in default mode network activity and connectivity," *PNAS* 108, no. 50 (2011): 20254–20259. The default mode network underlies self-referential thought and mind-wandering, and is quieted in experienced meditators.
- 15 On ego-dissolution as a quieting/reorganization of the self-network rather than a pathology, and its resonance with Jung's individuation, see Human-Friedrich Unterrainer, "Oceanic states of consciousness—an existential-neuroscience perspective," *Frontiers in Human Neuroscience* 19 (2025): 1653801, doi:10.3389/fnhum.2025.1653801; and Andrei V. Lebedev et al., "Finding the self by losing the self: Neural correlates of ego-dissolution under psilocybin," *Human Brain Mapping* 36, no. 8 (2015): 3137–3153. Unterrainer explicitly frames Jung's account of ego-dissolution during individuation as a "transformative encounter with the unconscious" and reads DMN modulation as flexible reorganization, not dysfunction. *Register note*: this ego-dissolution literature spans both meditation and psychedelics; I draw here on the meditative/contemplative strand consistent with the essay's frame.
- 16 René Descartes, *The Passions of the Soul* (1649), Part I, arts. 31–32, and his letter to Mersenne of 30 July 1640 (AT III:124): because the soul is "one and indivisible," Descartes reasoned its bodily seat must likewise be single and unpaired, and identified the pineal gland as the place where the doubled impressions of the two eyes are united into one before reaching the soul. For the history — including the striking fact that the same "unity requires a single midline organ" argument later led Lancisi (1712) to nominate the unpaired *corpus callosum* as the seat of the soul, before Zinn's (1749) split-brain experiments on dogs undercut the reasoning — see Gert-Jan C. Lokhorst, "Descartes and the Pineal Gland," *Stanford Encyclopedia of Philosophy*. *Register note*: the pineal-as-Ego reading here is symbolic; the literal left–right bridge is the corpus callosum (nn. 10, 12), and no serious modern account seats the self in a single gland.

- 17 On the pineal's evolutionary origin as a photoreceptive "third eye" — homologous to the still-functional parietal/pineal eye of lampreys, the tuatara, and various lizards — and its role as a neuroendocrine organ converting light information into melatonin and circadian timing, see Hiroaki Mano & Yoshitaka Fukada, "A Median Third Eye: Pineal Gland Retraces Evolution of Vertebrate Photoreceptive Organs," *Photochemistry and Photobiology* 83, no. 1 (2007): 11–18, doi:10.1562/2006-02-24-IR-813. *Accuracy note*: in humans the pineal is not itself light-sensitive; light is detected by the retina and relayed to the pineal, which converts that signal into melatonin — the sense in which it mediates and balances the day/night, waking/sleeping cycle.
- 18 Jon G. Dean, Tiecheng Liu, Sean Huff, Ben Sheler, Steven A. Barker, Rick J. Strassman, Michael M. Wang & Jimo Borjigin, "Biosynthesis and Extracellular Concentrations of N,N-dimethyltryptamine (DMT) in Mammalian Brain," *Scientific Reports* 9 (2019): 9333, doi:10.1038/s41598-019-45812-w. INMT (with AADC) transcripts were found in the cerebral cortex, pineal gland, and choroid plexus of both rats and humans, and extracellular DMT was measured in living rat cortex at levels comparable to serotonin — notably, with or without the pineal gland, indicating the pineal is not the sole or necessary source. For the skeptical counterweight, see David E. Nichols, "N,N-dimethyltryptamine and the pineal gland: Separating fact from myth," *Journal of Psychopharmacology* 32, no. 1 (2018): 30–36, which argues endogenous DMT concentrations are far too low to be psychoactive and that the pineal-DMT-mysticism link is unsupported. *Register note*: that the brain (pineal included) contains DMT and its synthetic machinery is established; that endogenous DMT produces mystical or near-death experience is speculative and disputed.
- 19 Christopher Timmermann, Leor Roseman, Luke Williams, David Erritzoe, Charlotte Martial, Hélène Cassol, Steven Laureys, David Nutt & Robin Carhart-Harris, "DMT Models the Near-Death Experience," *Frontiers in Psychology* 9 (2018): 1424, doi:10.3389/fpsyg.2018.01424 (a within-subjects, placebo-controlled study of 13 participants finding significant overlap with a validated near-death-experience measure). On the dying brain's surge of organized high-frequency activity, see Jimo Borjigin et al., "Surge of neurophysiological coherence and connectivity in the dying brain," *PNAS* 110, no. 35 (2013): 14432–14437 (rats); and Gang Xu, Jimo Borjigin et al., "Surge of neurophysiological coupling and connectivity of gamma oscillations in the dying human brain," *PNAS* 120, no. 19 (2023): e2216268120 (humans). *Register note*: the phenomenological resemblance and the dying-brain surge are real findings; any causal link between them, or to endogenous DMT, remains an open hypothesis.

