THE MAN WHO WASN'T THERE

INVESTIGATIONS INTO
THE STRANGE NEW SCIENCE
OF THE SELF

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DUTTON
est. 1852

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WHEN YOU ARE BESIDE YOURSELF

OUT-OF-BODY EXPERIENCES, DOPPELGÄNGERS, AND THE MINIMAL SELF

This proposition [that] . . . I am, I exist, is necessarily true each time that I pronounce it. . . . But I do not yet know clearly enough what I am.

—René Descartes

"Owning" your body, its sensations, and its various parts is fundamental to the feeling of *being someone.*

—Thomas Metzinger

My cousin's son, Ashwin, a youthful thirty-one-year-old, died of brain cancer recently. The first indication of a potential problem came in August 2009. Ashwin had had a major seizure. Neurosurgeons in New Delhi found and removed a benign tumor from the left temporoparietal region. Within months of the operation, he began having seizures again. Scans revealed nothing new, so he was put on anticonvulsant medications. Ashwin learned to recognize the onset

of seizures, usually pins and needles in his right arm and leg. If he was driving, he'd pull over and take some deep breaths (his mother's instructions), and wait for the seizure to pass. Moments later it would be over. Then, in early 2013, he was driving to work when something very odd happened. He immediately stopped his car on the roadside and called his mother.

"Mom, I had a very strange experience," he told her. "I saw another Ashwin in front of me." He was in no doubt as to what he had seen and experienced: his own self facing him. He was even aware of the emotional state of this double. Ashwin told his mother that the second Ashwin was angry, resentful, frustrated (an emotional state that mirrored how he used to be in his twenties, my cousin told me). Thankfully, the double disappeared, and Ashwin could drive again. His neurologist attributed the experience to a seizure and adjusted his medication.

Within a year, however, Ashwin's condition worsened. His tumor returned, this time with a vengeance. It was malignant, and in the left frontotemporal region, its tentacles spreading into the left insular cortex. Surgery and radiation therapy bought him some time, but not much. Ashwin passed away very suddenly one evening.

What Ashwin experienced that morning in his car is a phenomenon called the doppelgänger effect. It's a complex hallucination that involves the feeling that there is another illusory body of oneself nearby, as happened in his case. While Ashwin remained in his physical body, often the person hallucinating can find that his or her center of awareness—the sense of being in a body looking out—can shift from the physical body to the illusory body. The person switches perspective, seeing the world either from the physical body or the illusory body, sometimes moving back and forth in rapid succession. Another

distinguishing characteristic of the doppelgänger effect is often the presence of strong emotions. One of the most cited accounts in the medical literature of the doppelgänger experience is of a young man who jumped off a four-story building to reconcile his self with his body.

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More than two decades ago, Peter Brugger, as a PhD student in neuropsychology at the University Hospital Zurich in Switzerland, was developing a reputation as someone interested in scientific explanations of so-called paranormal experiences. A fellow neurologist, who had been treating a twenty-one-year-old man for seizures, sent the patient to Brugger. The young man, who worked as a waiter and lived in the canton of Zurich, had very nearly killed himself one day, when he found himself face-to-face with his doppelgänger.

The incident happened when the young man had stopped taking some of his anticonvulsant medication. One morning, instead of going to work, he drank copious amounts of beer and stayed in bed. But it turned out to be a harrowing lie-in. He felt dizzy, stood up, turned around, and saw himself still lying in bed. He was aware that the person in bed was him, and was not willing to get up and would thus make himself late for work. Furious at the prone self, the man shouted at it, shook it, and even jumped on it, all to no avail. To complicate things further, his awareness of being in a body would shift from one body to the other. When he was inhabiting the supine body in bed, he'd see his duplicate bending over and shaking him. That's when fear and confusion took hold: Who was he? Was he the man standing up or the man lying in bed? Unable to take it, he jumped out the window.

When I visited Brugger in the autumn of 2011, he showed me a

photograph of the building from which the man had jumped: he had been extremely lucky. He had leapt from a window on the fourth floor and landed on a large hazel bush, which had broken his fall. But he had not really wanted to commit suicide, said Brugger. He had jumped to "find a match between body and self." After getting treatment for his fall-related injuries, the young man underwent surgery to remove a tumor in his left temporal lobe, and both the seizures and the bizarre experiences stopped.

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Doppelgängers are the stuff of literature: from Edgar Allan Poe's "William Wilson," in which William, tormented by his double, stabs him, only to realize that he himself is bleeding, to Guy de Maupassant's short story "Le Horla," in which the main character murders his double, but laments at the end, "No . . . no . . . of course not . . . of course he is not dead. . . . So then—it's me, it's me I have to kill!," fictional doubles abound.

Broadly, such hallucinations are classified as *autoscopic phenomena* (from "autoscopy"; in Greek, *autos* means "self" and *skopeo* means "looking at"). The simplest form of an autoscopic phenomenon involves feeling the presence of someone next to you without actually seeing a double—a sensed presence. Olaf Blanke, a neurologist at the Swiss Federal Institute of Technology in Lausanne, Switzerland, told me that a sensed presence is like experiencing a full-body phantom: if a phantom limb is the continued sensation of having a limb that has been amputated, then a sensed presence of a body is its full-body analogue.

T. S. Eliot immortalized such an extracorporeal presence in his poem *The Waste Land*: "Who is the third who walks always beside you? / When I count, there are only you and I together."

As it turns out, Eliot was inspired by accounts of the Antarctic explorer Ernest Shackleton, who wrote in his diaries that he and expedition team members Frank Worsley and Tom Crean, on the last leg of an unimaginably dangerous and difficult journey to find help to save the other stranded members of their trans-Antarctic expedition, began feeling the presence of a fourth person. Shackleton wrote, "I know that during that long and racking march of thirty-six hours over the unnamed mountains and glaciers of South Georgia it seemed to me often that we were four, not three. I said nothing to my companions on the point, but afterwards Worsley said to me, 'Boss, I had a curious feeling on the march that there was another person with us.' Crean confessed to the same idea. One feels 'the dearth of human words, the roughness of mortal speech' in trying to describe things intangible, but a record of our journeys would be incomplete without a reference to a subject very near to our hearts." We now know that it's not uncommon for oxygen-deprived mountaineers to report sensing the presence of another.

Autoscopic phenomena can go beyond just a sensed presence. There is the doppelgänger effect, in which a person may hallucinate that they are actually seeing another "me"—a visual double. Often, the hallucination is very emotional, and the person's sense of location and identity switches between the real and the illusory bodies, as experienced by Brugger's twenty-one-year-old patient.

Probably the most widely experienced and best-known form of autoscopic phenomena is the out-of-body experience (OBE). During a classic full-blown OBE, people report leaving their physical body and seeing it from an outside perspective, say from the ceiling looking down at the body lying in bed.

During my discussions with Michaele about her husband Allan's

battle with Alzheimer's disease, I mentioned to her that I was also writing about out-of-body experiences. As it happened, well before she met Allan, Michaele had an intense out-of-body experience. She was in her thirties and pregnant with her fourth child. When it came time to have the baby, a son, she chose a home birth, in the presence of a midwife and a physician. Her water broke one night, and the next morning her physician went over to the local abortion clinic to get a tablet of Pitocin, which can be used to induce labor. Michaele put the pill under her tongue and soon went into labor. She had chosen not to take painkillers. At the very peak of the process, just as she had pushed her baby out, the pain became unbearable. Michaele felt herself leave her body. "I literally was up at the corner of the ceiling, looking down at the whole scene, watching everything happen," she told me. "I just left my body. It got so intense that I went above, and as soon as it was over, I was back, right back in my body again. It was the weirdest thing." She thinks the whole episode may have lasted just a few seconds, but more than three decades later, the experience is still etched in her mind. "It's not something I have talked about a lot," she said. "I have only told a few people that I feel would understand."

Many people who have such experiences are reluctant to talk about it. OBEs give the person a strong sense of dualism of body and mind: your center of awareness, which is usually anchored in your body, seems to float free of it. We saw earlier how the bodily self is the foundation for our sense of self, and disruptions of the bodily self can cause BIID, schizophrenia, and perhaps even autism. In all these cases, however, the center of awareness remains anchored to the body, however impaired the perception of it may be. OBEs mess with this center of awareness—suggesting a Cartesian duality. But if you examine OBEs closely, it turns out that the duality is an illusion, a product of a

brain that fails to correctly integrate all the signals from the body. Despite their vividness, OBEs are hallucinations caused by malfunctions in brain mechanisms; elucidating these mechanisms gets us closer to understanding how the brain constructs the self.

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Back at the University Hospital Zurich, Peter Brugger tried gamely to induce in me an out-of-body illusion. We were wandering the corridors of the hospital. I was wearing virtual-reality goggles. Brugger was walking about three feet behind me, filming me using my notebook computer's webcam and feeding the video into the goggles I was wearing. So, instead of seeing where I was going, I was seeing myself from behind, walking about three feet in front of me. We must have been a sight as we walked past curious interns and hospital staff. Brugger, looking like an absentminded professor with his white lab coat and wild, graying hair, holding aloft an open notebook computer, and me walking in front, blind but for what I was seeing in the VR goggles.

The setup didn't quite work. We should have been using a good video camera, which we didn't have at the time, and longer wires so that Brugger could have been farther behind me. But I did feel weird walking around watching myself from behind.

In 1998, when Brugger first tried the experiment, he wore such goggles for an entire day, and had someone walk about twelve feet behind him, filming him with a video camera. So, if Brugger was picking a flower, or putting a letter in a mailbox, he'd see himself doing the act from an outside perspective. "This was extremely strange. I lost the sense of where I actually was," he told me. "I was where I saw the action, rather than where I was actually executing the action." Brugger was having an out-of-body illusion: the sense of where he was located had

shifted several feet, from being in his physical body to being in the virtual body.

But Brugger never actually performed the experiment in a rigorous laboratory setting and so never published the results, though it did get mentioned in an article in *Science*.

He credits American psychologist George Malcolm Stratton (1865–1957) as the inspiration for this experiment. Stratton had spent a good part of his career at the University of California, Berkeley. He is best known for "perhaps the most famous experiment in the whole of experimental psychology." Stratton fashioned a contraption that allowed him to see upside down. He walked around with this device on his right eye. He blacked out the left eye, because seeing upside down with both eyes was extremely disorienting. For three days and a total of 21.5 hours, he did nothing but use this device. When he went to bed, he strapped his eyes shut. While the primary motivation for the experiment was to understand visual perception, Stratton experienced other subtle changes in bodily perception. For instance, if he stretched out his hand to touch something, because he was seeing everything upside down, the hand would enter the visual field from above rather than below. Soon, "parts of my body . . . were seen to be in another position."

Stratton realized that he was onto something. In 1899, he published another paper, in which he described a crazier experiment, this time with mirrors. He built a frame that he affixed to his waist and shoulders. The frame held a mirror horizontally above his head. He used the frame to position another mirror at a forty-five-degree angle in front of his eyes, so that it reflected the image from the overhead horizontal mirror directly into his eyes. The net effect was that Stratton was seeing himself and the space around him from the perspective

of someone looking down at his head from above. He made sure that no other light entered his eyes. Again, he walked around with this contraption for three days, for a total of twenty-four hours, with his eyes blindfolded when he was not experimenting and when he slept. Doing so, he was able to create a disharmony between sight and touch: when he'd reach out to touch something, his hands felt the touch, but his eyes told him that the touch was somewhere else entirely. It was now up to the brain to bring everything back into harmony, with interesting consequences.

Because Stratton was seeing his own body from above and nothing else, he had to pay close attention to this visual image to guide his actions and movements. By afternoon on the second day he began to notice that the reflected image sometimes felt like his body. This feeling became more persistent on the third day, especially when he was walking with ease and speed, not making any special effort to differentiate between where he was perceiving his body to be and where he "knew" his body to be. "In the more languidly receptive attitude during my walk, I had the feeling that I was mentally outside my own body," he wrote. Stratton had induced in himself an out-of-body experience.

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Out-of-body experiences, autoscopic hallucinations, and doppelgänger phenomena are probably our best window on some very basic aspects of our sense of the bodily self. It's become increasingly clear that the brain's representation of one's body and our conscious experience of it underpin self-consciousness. Having a bodily self, or being embodied, means several things. At the very fundamental level, it situates the center of our awareness. You are in a body that feels like it is yours—this is the sense of self-identification and body ownership. You

also feel that the body occupies a certain volume in physical space and you are located in that volume—the sense of self-location. Finally, you look out at the world from a point behind your eyes and you have the sense that this vantage point is yours and yours alone—you have what philosophers call a first-person perspective on the world.

The rubber-hand illusion is a classic example of how aspects of this bodily self can be disrupted. As we saw in chapter 3, when an experimenter strokes a visible rubber hand and the hidden real hand synchronously, the rubber hand is temporarily incorporated into one's bodily self. We feel touch at the location of the rubber hand and there's a sense of ownership of this otherwise lifeless object.

Henrik Ehrsson's team at the Karolinska Institute in Stockholm, Sweden, got people to experience the rubber-hand illusion while they lay inside an fMRI scanner. The findings were revealing. The strength of the illusion was strongly correlated with activity in the premotor cortex, a region in the brain that forms a network with the cerebellum and with parietal areas that process vision and touch. Parts of the parietal brain regions integrate vision, touch, and proprioception, and it's well known that people with parietal lesions sometimes deny ownership of their limbs.

Neuroscientists think that the so-called multisensory integration of various sensations is responsible for giving us a sense of ownership over our body and body parts. Normally, vision, touch, and proprioceptive sensations all match up. They are congruent, and it's this congruency that's key to giving a body part a sense of *mineness*. During the rubber-hand illusion, proprioceptive distortions are kept to a minimum by keeping the real hand relaxed and not too far from the rubber hand. The brain erroneously integrates the misleading visual sensations and the real sensations of touch, and decides that the rubber

hand is real. That's why we can lose ownership of the actual hand and gain ownership of the rubber hand. This switch in ownership has real physiological consequences: for instance, the temperature in the real hand drops by nearly 1 degree Celsius (about 2 degrees Fahrenheit)—an autonomic nervous system response that's not under conscious control.

In Ehrsson's lab, I got to experience the rubber-hand illusion for the first time (having failed in earlier attempts). Arvid Guterstam, a postdoc in Ehrsson's lab, played host and subjected me to the illusion. Having done it innumerable times, he was quite the expert. I felt the illusion of owning the rubber hand rather strongly. But then Guterstam did something that jolted me further. Once I began feeling the touch in the location of the rubber hand, he lifted his brush a couple of inches above the rubber hand and continued moving the brush synchronously with the movement of the brush on my real hand.

"What was that?" I said. "What's happening? This is really weird."

He was moving the brush in the air and I was feeling the touch of the brush in the space above the rubber hand.

It turns out the neurons in the premotor cortex have what's called a receptive field—they fire not just when a body part is touched but when the proximal space around that body part is touched (this is called peripersonal space). My brain had remapped the location of my hand and centered it on the rubber hand. The space above the rubber hand had become my peripersonal space, and consequently a brushstroke in the space above the rubber hand was now registering as a touch at that location.

Ehrsson's team has also shown that you don't even need a rubber hand to experience the illusion: just the brush strokes on the hidden real hand combined with synchronous movements of a brush in empty

space, in a manner that's suggestive of a hand there, is enough to generate the illusion of being touched at a location where there is no real hand.

Scientific explanations aside, I was thrilled to have finally experienced the illusion, and said so.

"You seem to have an easily fooled brain," Guterstam quipped.

Fooling the brain to take ownership of a rubber hand is just one piece of the puzzle that is bodily self-consciousness. A hand is just a constituent of the bodily self. How much more can one manipulate the bodily self? Much, much more, as it turns out.

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As a young man in the late 1970s and early 1980s, Thomas Metzinger felt conflicted about telling anyone about his out-of-body experiences. One of those happened when he was studying to become a philosopher, and intensely curious about altered states of consciousness. He was attending a highly regimented meditation retreat in the Westerwald, about sixty miles northwest of Frankfurt, Germany. Ten consecutive weeks were filled with yoga, breathing exercises, and individual and group meditation sessions. Metzinger immersed himself in all that was asked of him. One Thursday, the retreat organizers had baked a cake—to celebrate the teacher's birthday. It was a rich, greasy cake. Metzinger ate some of it. Feeling unwell, he went to bed and fell asleep.

He woke up wanting to scratch his back, and realized he couldn't move. His body was paralyzed. It was then that he felt himself spiraling out of his own body, up and in front of his bed. It was dark, so he didn't actually turn around and see his body lying in bed. He was scared, but something scarier was to follow.

He suddenly realized that there was someone else breathing heavily in the room. "And then I panicked," Metzinger told me as we sat at the dining table in his home in rural Germany, a few tens of miles east of Frankfurt. "Somebody was there; I couldn't move my body, I was dissociated from my body. It was very unpleasant." There was, of course, no one else in that room, and only many years later would Metzinger find explanations for such experiences in the scientific literature. It turns out that in certain dissociative states, you cannot recognize self-generated sounds as self-generated; in Metzinger's case, he lost a sense of ownership of the sounds of his own breathing, hence the hallucination of someone breathing near him.

Metzinger alerted his meditation teachers, but to his dismay all they did was put him under a cold shower and tell him to meditate less (today, as someone who advocates meditation training in schools, Metzinger is concerned and critical that many meditation centers do not have staff trained to deal with altered states of consciousness or psychiatric emergencies).

Soon afterward, Metzinger moved to a remote region south of Limburg, to concentrate on writing his doctoral dissertation on the mind-body problem and also to deliberately confront himself with the consequences of solitude and boredom—a personal project. As a poor student, with little money to even call his friends in Frankfurt, he lived alone in a 350-year-old house, taking care of sheep and nineteen fishponds. He meditated a lot. And he had a few more unexpected, spontaneous out-of-body experiences. But by now, his curiosity and analytical mind had taken over: he wanted to understand his experiences. His extensive study of the scientific and philosophical literature was showing a complete lack of evidence that consciousness could be dissociated from the brain. Yet there he was, having extremely vivid

experiences of apparent dualism in which his conscious self was seemingly separated from his own body. And he knew he could tell no one except his closest friends.

So, as a budding philosopher of mind and cognitive science getting grounded in empirical data, he tried conducting his own experiments while in those altered states, to see if brain and consciousness could indeed be separated and whether that would lead to conclusive, verifiable observations. He learned to control his initial fear during his OBEs, but not entirely. Despite his efforts, he uncovered not a shred of evidence that his conscious self had actually dissociated from his body.

Meanwhile, he had conversations and exchanges with other researchers. One British psychologist, Susan Blackmore, after fierce and extended discussions, finally managed to convince him that his OBEs were actually hallucinations. She quizzed him about how he moved from his physical body, which was lying in bed, to the windowsill during an out-of-body experience. Did he walk over there? Did he fly? Metzinger realized that his movements were unlike anything that happens in real life. "Sometimes, it's almost as if the moment you think you want to go there you are already there," he told me. Blackmore argued that he was hallucinating, moving between mental representations of, say, the bed and the window, jumping or gliding from landmark to landmark in his mind. Metzinger realized that he was not moving in his bedroom but within an internal model of his bedroom created by his brain.

Another really strange experience convinced him even more that he was indeed hallucinating. He had an OBE, and when he returned to his body he ran to wake up his sister, to tell her of his experience. "It's quarter to three, can't it wait until breakfast?" she told him. But

then an alarm went off, and Metzinger woke up—again. He wasn't in Frankfurt in his parents' house with his sister. Rather, he had been taking an afternoon nap in a house that he shared with four other students. He had experienced what dream researchers call "false awakening": a dream that he had woken up. But prior to the false awakening, he had dreamed he had an OBE. "It began to dawn on me that there are multiple transitions between different classes of altered states of consciousness," he said. He had been having such vivid out-of-body experiences that he had even begun dreaming about them.

Metzinger's OBEs stopped after six or seven such episodes. But they have informed his thinking about how the brain might be causing them and what it tells us about the self, eventually resulting in his definitive monograph: *Being No One: The Self-Model Theory of Subjectivity.* The work caught the attention of Olaf Blanke, the neurologist whom I met at the Swiss Federal Institute of Technology in Lausanne.

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In 2002, Blanke had induced repeated out-of-body experiences in a forty-three-year-old woman. He had been treating her for drug-resistant temporal-lobe epilepsy. Brain scans did not show any lesions, so Blanke resorted to surgery to figure out the focus of her epilepsy. His team inserted electrodes inside the cranium to record electrical activity from the cortical surface directly, rather than from outside the skull as you would if you were using standard EEG. During this procedure, the woman volunteered to have her brain stimulated using the implanted electrodes. This technique allows surgeons to double-check that they've really found the cause of the seizure, while also ensuring that they don't excise some key brain region. And not just that. The procedure, pioneered by Wilder Penfield, is often the best way to find

out the function of different brain regions, and much of what we have learned about the brain has come from courageous patients who have let themselves be stimulated while conscious. It was during such a procedure that Blanke found that there was one electrode, placed on the right angular gyrus, that, when stimulated, caused the woman to report some rather weird sensations.

When the stimulating current was low, she reported "sinking into the bed" or "falling from a height"; when Blanke's team increased the amperage, she had an out-of-body experience: "I see myself lying in bed, from above," she said. The angular gyrus lies near the vestibular cortex (which receives inputs from the vestibular system that's responsible for our posture and sense of balance). Blanke concluded that the electrical stimulation was somehow disrupting the integration of various sensations such as touch with vestibular signals, leading to the woman's OBE.

The next step in studying OBEs in a controlled setting was to try to induce full-body versions of the rubber-hand illusion in healthy subjects in a laboratory. In 2005, Metzinger proposed an experiment to do just that. He teamed up with Blanke and Blanke's then student Bigna Lenggenhager. The setup they used was simple and elegant. A camera filmed a subject from behind, and the images were sent to a 3-D head-mounted display that the subject was wearing. The subject could see only what was being shown in the display, which was the back of his or her own body, seen in 3-D and about seven feet in front (this was analogous to my seeing the rubber hand rather than the real hand). The experimenter would then stroke the person's back with a stick. The subjects would feel the stroking on their backs, but would also see themselves being stroked in the head-mounted display. The stroking was either synchronous or asynchronous (to make it asynchronous, the video feed was delayed a smidgen, so the subject felt the touch first but saw the virtual body being stroked an instant later). Again, this is not unlike the rubber-hand illusion experiment—nor were the results dissimilar. In the synchronous condition, once the illusion set in, some subjects (but not all) reported feeling the touch in the location of the virtual body about seven feet in front of them and that the virtual body felt like their own.

A few years later, Blanke's team upped the ante. They rigged a setup that allowed them to conduct the same experiment inside a scanner. The subject was lying down, and a robotic arm stroked the subject's back. Meanwhile, the subject viewed through a head-mounted display a video of a person being stroked on the back. The robotic arm's stroking was either synchronous or asynchronous with stroking of the virtual person seen on the display. Again, in some subjects, their sense of location and sense of body ownership were shaken up. One of the most striking outcomes was when a subject reported "looking at my own body from above," even though the subject was lying prone, face-up, in the scanner.

"That was for us really exciting, because it gets really close to the classical out-of-body experience of looking down at your own body," said Lenggenhager, who is now working in Peter Brugger's group at the University Hospital Zurich.

The subjects were scanned during their experiences, and the scans revealed that their sense of being out-of-body was correlated with activity in the temporoparietal junction (TPJ), a site that integrates touch, vision, proprioception, and vestibular signals. Here was some objective evidence that self-location—where you perceive yourself to be—has to do with neural activity in the TPJ.

When I visited Lausanne, Blanke's student Petr Macku offered to

try the illusion out on me and I gladly accepted, for that was partly why I was visiting. He used the same equipment, except for a scanner—but I must have been too tense (having just arrived from Paris), and possibly expecting too much, because the illusion didn't work on me. The other likely explanation is that the full-body illusion is a weak effect, and does not work on everyone. I did feel a bit strange, but that was it.

I was subjected to yet another full-body illusion in Henrik Ehrsson's lab in Stockholm (where I had successfully experienced the rubber-hand illusion). In this case, I stood facing a life-size mannequin, mirroring its outstretched hands. The mannequin had cameras for eyes and it was gazing down at its abdomen and hands. The camera output was fed into a head-mounted display that I was wearing. So, I was seeing the mannequin's abdomen and hands. Arvid Guterstam, the expert manipulator of rubber hands, again did the honors: using two big paintbrushes, he stroked my abdomen and hands, while doing the same to the mannequin's abdomen and hands, synchronously. I was feeling the touch on my body but seeing the mannequin's body being touched. Nothing much happened when he was stroking the abdomen (so much for my easily fooled brain), but after a couple of minutes, when he would brush my fingers, I would feel as if the mannequin's fingers were being touched. I was identifying with the mannequin's fingers as my own, if not its full body.

Henrik Ehrsson's team carried out a similar experiment inside a scanner, and subjects reported identifying with the mannequin's body. Many said they felt that the mannequin's body was their own. The scans showed that activity in the ventral premotor cortex in both hemispheres, along with activity in the left intraparietal cortex and the left putamen, was correlated with feelings of body ownership, with

the correlation being strongest for the ventral premotor cortex. It's known from studies of macaque monkeys that neurons in these regions also integrate vision, touch, and the proprioceptive sense.

What's clear from these studies is that aspects of our sense of self that we take as given and immutable—a sense of body ownership, a sense of where the self is located, and even the perspective from which the self observes—can be disrupted, even in healthy people.

It's also becoming evident that self-location, self-identification, and first-person perspective are the result of different brain regions integrating the various sensations—touch, vision, proprioception, and vestibular sensations—to construct these aspects of selfhood. For instance, in the Ehrsson lab version of the full-body illusion, they were able to manipulate a sense of body ownership, and identify the correlated brain regions (mainly the ventral premotor cortex). The Blanke lab version of the illusion messed with perspective and self-location, and that potentially explains why they found a different brain region—the TPJ—as the main culprit.

The exact brain regions aside, the strong message here is that these attributes of self-location, self-identification, and first-person perspective are constructed by the brain. The brain creates a body-centered frame of reference, and everything we perceive is then intimated to us in terms of this frame of reference.

So far, we have been talking of the integration of various external sensations with sensations that tell the brain about the orientation of the body and the location of body parts. But there is another important source of sensations—something we are normally unaware of—which are signals from inside the body, especially the viscera (which contain information about the beating heart, blood pressure, and the state of the gut, for example). We saw in an earlier chapter how these internal

sensations are key to emotions and feelings, and that malfunctions in this pathway can lead to depersonalization and feelings of being estranged from oneself. It turns out that in order to anchor the self to the body, the brain has to integrate signals from within the body with external sensations, and with sensations of position and balance. When something goes wrong with brain regions that integrate all these signals, the results are even more dramatic than out-of-body experiences. They lead to the doppelgänger effect, the kind Ashwin experienced sitting in his car and that caused Brugger's patient to jump out of a fourth-floor window in Zurich.

One of the most striking aspects of the doppelgänger effect is the presence of strong emotions—and what this reveals about the brain mechanisms involved. Of all the accounts that I've heard or read about, none had a stronger emotional content than Chris's experience, in which his double communicated with his brother, who had just died of HIV/AIDS.

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Chris grew up in the San Francisco Bay Area. He was seven years older than his brother, David. As children, Chris and David fought all the time, "as brothers often do." It wasn't until Chris moved out of their parents' house that the brothers realized they missed each other. Over the next decade their relationship deepened. They also had a natural comedic chemistry; they were the "Martin and Lewis of the family," with David being Jerry Lewis to his elder brother Chris's Dean Martin. The gags were constant. They made outrageous bets with each other. David took on a bet, for instance, that he could eat an entire two-pound block of cheddar cheese all at once—an effort that had the family in stitches around the kitchen table as they watched David trying to stuff the cheese into his mouth, eventually just laughing hysterically and drooling melted cheese.

They played a relentless game of "gotcha." Chris recalled one incident where he got David well and good. David at the time was sporting an Afro hairdo and was sitting and watching TV with the family. Chris had been working on the water heater outside the house when he spied a large alligator lizard, a native California species. Chris caught the lizard and put it into a pocket of the overalls he was wearing. He came back into the house and discreetly maneuvered himself behind David and dropped the lizard on his Afro.

David knew Chris was up to something but was blasé about it. "Then the lizard took off. It ran right across the top of his head, down his face, and jumped onto his chest. My brother just screamed, and levitated off of the chair," Chris told me. "I swear he was two feet off the ground, screaming all the way across the room." Once David realized he'd been had, he laughed too, and then everyone spent the next forty-five minutes looking for the lizard. They never found it, dead or alive.

When David turned sixteen, he asked if he could come and spend the weekend with Chris. It was uncharacteristic of him to come for a whole weekend, so Chris knew something was up, and even had an inkling of what. Toward the end of the visit, a nervous David said, "Chris, I have to tell you something." Chris said OK, tell me.

"I'm gay," said David.

"Tell me something I don't know," said Chris.

"What? You know?"

"I've known since you were nine. Come on, how could I not know? I'm your brother," said Chris.

Eventually, David came out to his parents, who were crushed, es-

pecially their mother. Chris got mad at his parents, and confronted them about whether they saw any difference between him (the straight son) and David. "It kind of smacked them a little bit, stung a bit," Chris told me. But soon enough, the family came together.

A few years later, David told Chris that he had contracted HIV. "He was running around with a wild crowd over in San Francisco," said Chris. "There was a lot going on of what you might traditionally expect of San Francisco in the late '70s and early '80s." This was the early days of the HIV/AIDS epidemic, and HIV drugs weren't as effective. David knew he was dying, so he asked Chris to write his eulogy for the impending funeral.

"You can't die, I'll be alone," Chris told him. "There won't be Lewis to my Martin." Even decades later, as he told me this, Chris's voice broke; he could not contain his sadness.

David died with family by his bedside holding him. Chris and their father spoke at the funeral, with their father speaking of David's serious side, while Chris narrated the Martin-and-Lewis stories. And in accordance with David's wishes that they play "Amazing Grace" at the funeral, a Scottish piper in a kilt played the tune until the service was over.

About two months later, Chris woke up from his sleep. It was early in the morning. He got off the bed, stood up, and walked toward the end of the bed, where there was a dresser. He stretched and turned around and got the fright of his life.

"The shock was electric," Chris recalled. "Because I was still lying in the bed sleeping, and it was very clearly me lying there sleeping, my first thought was that I had died. I'm dead and this is the first step. I was just gasping. My head was spinning, trying to get a grip on things."

And then the phone rang.

"I don't know why, but I picked up the phone and said, 'Hello.' It was David. I immediately recognized his voice. I was overwhelmed, but at the same time I had this incredible sensation of joy." But David didn't stay on the line for long. "He told me that he didn't have much time and he just wanted me to know that he was all right, and to tell the rest of the family, then he hung up," Chris said.

"And then there was this enormous sucking sensation," said Chris, making a long, drawn-out slurping sound. "I felt like I was dragged, almost thrown, back into the bed, smack into myself." He woke up screaming. His wife, Sonia, who was asleep next to him, woke up to find a hysterical Chris.

"I was totally freaked out, I was shaking all over, I was sweating, my heart was beating like a racehorse's," said Chris.

Chris grew up in a scientific household. His father is a renowned nuclear physicist. Chris's upbringing was at odds with this experience. "My heart tells me that David was letting me know that he was OK. I really believed at the time that he was somehow communicating with me from beyond death," Chris said. "But my intellectual side says that's just silly. But it's so hard to rationalize; the experience was so real."

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What Chris experienced was a particularly intense doppelgänger effect, also known in neuroscientific jargon as heautoscopy. It is different from an out-of-body experience in many ways.

In an OBE, the self, or center of awareness, gets dissociated from the physical body. The self identifies with a different location in space and has an altered perspective. The physical body itself is usually perceived as lifeless.

In heautoscopy, you perceive an illusory body, and your center of

awareness can shift from within the physical body to the illusory body and back—there's self-location and self-identification with a volume in space, whether that volume is centered on the physical body or the illusory body. The perspective also shifts accordingly. In Chris's case, he was situated in his illusory body and then got sucked back into the physical body. But in other cases, such as for Brugger's young patient, one might experience this shift many times before the hallucination ends.

The other key components of heautoscopy are the presence of intense emotions and the involvement of the sensory-motor system. "Usually, the double is moving and there is interaction, there is sharing of emotions, of thoughts, and that's what's giving the impression of a doppelgänger," said neurologist Lukas Heydrich, who was at the Swiss Federal Institute of Technology in Lausanne when I met him.

To understand the differences in the neural activity associated with (or the neural correlates of) just seeing a visual double while remaining anchored to the physical body versus actually interacting and switching perspectives with a double, Heydrich and Blanke decided to study patients with brain damage who also experienced these autoscopic phenomena. In 2013, they published the results of the largest such sample to date. The data tell us a lot about the neural correlates of such experiences.

Patients who reported autoscopic hallucinations had lesions in the occipital cortex. Heydrich and Blanke hypothesize that simply seeing a double is not a disturbance of the bodily self, since self-identification, self-location, and first-person perspective remain intact. Rather, the hallucination is the result of the loss of integration between visual and somatosensory signals.

Patients who reported heautoscopic hallucinations, on the other

hand, showed damage to the left posterior insula and adjacent cortical areas. Given that heautoscopic hallucinations involve emotions, it's revealing that the insular cortex is implicated. We saw how in depersonalization, lowered activity in the insula was correlated with the symptoms of emotional numbness (recall the way tattooed Nicholas back in Nova Scotia felt a lack of emotional vividness). The insula is the hub that integrates visual, auditory, sensory, motor, proprioceptive, and vestibular signals with signals from the viscera. It's the brain region where the body's states seem to be represented and the representations are eventually manifested as subjective feelings.

Heydrich and Blanke hypothesize that disturbances in the integration of signals in the insula are leading to the doppelgänger effect. If everything is working as it should, the insular cortex, particularly the anterior part of the insula, is thought to create a subjective feeling of one's body—a perception that includes emotions and actions. When abnormalities arise in the integration, it's as if there are now two representations of the body instead of one, and somehow the brain has to choose the representation in which to anchor the self, or rather choose which representation to imbue with self-location, self-identification, and first-person perspective. The hallucination happens when that trinity of parameters defining the basic bodily self switch between different body representations, one of which is not centered in the physical body in terms of geometric coordinates.

Metzinger and Blanke believe that these disturbances of the bodily self are helping them identify the basic attributes you need in order to feel like an embodied self—what they call the *minimal phenomenal self.* To start with, they argue that the sense of agency is not key to a minimal phenomenal self, since you can create a sense of being a body in some other location by merely passively stroking someone's

back and messing with their visual input. This requires no agency on the subject's part. "From a philosopher's point of view, it is important to find out what is necessary and what is sufficient for self-consciousness," Metzinger told me. "We have shown that something that most people think is necessary is not necessary, namely agency."

Rather, the minimal phenomenal self is a more primitive embodied self. Metzinger argues that this feeling of being embodied is a prereflective, prelinguistic form of selfhood—something that comes long before we have the capacity to use the personal pronoun in phrases like "I think." There's no narrative here, just the organism having the sense of being a body. The next step in the process is when this primitive selfhood, which is merely an embodiment, turns into selfhood as subjectivity. "If you not only feel that you are in that body, but if you can control your attention, and attend to the body, that's a stronger form of selfhood," said Metzinger. "Then you are something that has a perspective, something that is directed at the world, and something that can be directed at itself. That is more than mere embodiment."

We are now getting close to the heart of the debate over the self. The issue that concerns philosophers and neuroscientists is the subjectivity of the self. Where does that come from? As you can imagine, opinions differ. Blanke, for instance, disagrees with Metzinger's idea that attention is needed for a strong, subjective selfhood. Blanke thinks that selfhood that arises out of a combination of a sense of body ownership, self-location, and first-person perspective should be independent of attention. We don't have the empirical data to sort out these nuances. Still, despite these disagreements, there's excitement that studying autoscopic phenomena will get us closer to understanding the "I," the self-as-subject, than almost anything else.

Why did this minimal phenomenal self evolve in the first place? Most likely as an adaptation that let the organism orient itself and function better in its environment. If the brain evolved to help the body avoid surprises and remain in homeostatic equilibrium and to effectively move around in its environment, then representing the body in the brain was a necessary step to fine-tune these abilities. Eventually, this representation became conscious, further enabling the organism to be aware of the body's strengths and weaknesses, which must have given it a survival advantage. But in this case, rather than physical attributes, it was the self that was being honed in evolutionary time.

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Saying that the brain models the body doesn't quite get at the heart of the sense of ownership of the body, or the sense of *mineness*. The brain models things in the environment too, but they don't have the same feelings attached to them. Take the rubber hand. Once the illusion sets in, you feel as if the rubber hand is yours, but before the illusion, the rubber hand does not have that feel of *mineness* to it. We saw in the chapter on BIID that Metzinger's phenomenal self model (PSM) offers one kind of "representationalist" explanation. If the rubber hand is in the world-model constructed by the brain, it does not have a feeling of *mineness*, but if it's incorporated into the PSM, it becomes mine.

There are mechanistic explanations for the feeling of *mineness*. We saw hints of this in exploring schizophrenia. The feeling of agency—that *I* am the initiator of my actions, or a feeling of *mineness* to one's actions—may be the outcome of the brain being able to predict the consequences of one's motor actions correctly. If something goes wrong either in the prediction phase, when the prediction is

being compared to the actual outcome of the action, or for that matter anywhere in that pathway, then an action may not have the feeling of being self-initiated. And so it's implicitly attributed to an external agent—to non-self.

Could the feelings of body ownership arise due to similar mechanisms? Philosopher Jakob Hohwy has argued that the phenomenon of *mineness* in general—whether for actions or perceptions—can be the outcome of a predictive brain. So, in this way of thinking, the brain is using its internal models to predict the causes for various sensory signals, and the brain's job is to minimize prediction errors. So, just like a sense of agency results from successful predictions, a sense of body ownership would also result from minimal prediction errors for the body as a whole.

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Given all the talk of the minimal self and the extended narrative self, it's easy to get misled into imagining the self as an onion that can be peeled layer by layer, or as an orange that can be segmented. Yes, it's true that our narrative self has, in an evolutionary-biology sense, evolved after the bodily or minimal self, but in the complex selves that we are today, modern neuroscience is clearly telling us that the bodily self informs the narrative and your narrative can change how your body feels, and both the bodily self and one's narrative are influenced by one's cultural context. In this emerging understanding, brain, body, mind, self, and society are inseparable, insofar as a functioning human being is concerned.

Are there ways to test some of these linkages? Does an out-of-body experience influence perception and the construction of the narrative self?

Ehrsson's team had people experience a full-body illusion in which they felt ownership of virtual bodies that were as small as Barbie dolls (about a foot high) or as big as a thirteen-foot-high giant. Then they were asked about the objects they were perceiving (cubes of different sizes, placed at a constant distance from the camera). The subjects were more likely to perceive objects as being larger and farther away when they identified with Barbie dolls, and smaller and nearer when they felt they were giants. "One's own body size serves as an approximate reference for the entire external world in view," the team concluded. This is good evidence for the primacy of embodiment for our sense of self.

Ehrsson's lab also tested the effects of an out-of-body experience on episodic memory with an elaborate setup. They induced full-body illusions in subjects using the usual complement of head-mounted displays and synchronous stroking. During the illusion, subjects felt like they were watching a scene in a room from a different location than the location of their physical body. In the scene, an actor played the part of a professor and interacted with the subjects (all of whom were university students). The actor used a script that had been adapted from a Harold Pinter play called *One for the Road* (the adapted script was "not so dark and heavy as the original," said Ehrsson), and the interaction involved an oral examination, in which the student responded to questions. What Ehrsson's team wanted to answer was this: did people remember the episodes any less when they were under the influence of an illusion of being outside their physical body? In other words, does the brain's ability to encode episodic memory (which is essential to our narrative self, as we saw with Clare's father and Allan in chapter 2) depend on our being embodied in the physical body?

The short answer is yes. Those subjects who were out-of-body

during the encounter with the professor were less able to recall the episodes, compared to those who were in-body. "The out-of-body-created memories were significantly less structured in terms of temporal and spatial order of events, and less vivid," Ehrsson told me in an email.

If this is so, how, then, does one make sense of the vivid recollections of people who have had out-of-body and heautoscopic experiences? "Those memories are probably less vivid and temporally structured (more fragmented and less coherent) than they would have been if the same event would have been experienced in-body," said Ehrsson. At least initially. Then, by repeated retelling of their experience, people consolidate their fragmented memories and are eventually able to recall and narrate the experience with considerable vividness. It's also possible that the dramatic and emotional nature of such experiences counters some of the out-of-body-induced memory impairment. Regardless, the basic embodied self seems fundamental to the more evolved, cognitive, narrative self in more ways than one.

However, in none of these conditions we have explored so far—whether in labs or in the subjective experiences of people—does the narrative self ever shut down fully. It does happen, sadly, in Alzheimer's disease, but other cognitive abilities deteriorate too, debilitating the person in the process. But what if there were a way to be just the bodily self—just the organism living in the present moment, sensing, feeling, without the chatter of the narrative self? It almost sounds mystical, even New-Agey. But that's where we are headed.

8

BEING NO ONE, HERE AND NOW

ECSTATIC EPILEPSY AND THE UNBOUNDED SELF

If the doors of perception were cleansed every thing would appear to man as it is, infinite.

—William Blake

I feel a happiness unthinkable in the normal state and unimaginable for anyone who hasn't experienced it . . . I am then in perfect harmony with myself and the entire universe.

—Fyodor Dostoevsky

Zachary Ernst was eighteen, in his second semester of college at Western Michigan University in Kalamazoo, when he had his first epileptic seizure. It was winter, a time when Kalamazoo is usually cold, dark, and cloudy. Zach and his girlfriend were sitting in his dorm room when he suddenly felt panicked. His mood darkened, suicidally so. He began hearing music that clearly wasn't playing anywhere, except in his head. A terrified Zach made his girlfriend take him to her