

On Being **CERTAIN**

BELIEVING YOU ARE RIGHT
EVEN WHEN YOU'RE NOT

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The Feeling of Knowing

I AM STUCK IN AN OBLIGATORY NEIGHBORHOOD COCKTAIL party during the first week of the U.S. invasion of Iraq. A middle-aged, pin-striped lawyer announces that he'd love to be in the front lines when the troops reach Baghdad. "Door-to-door fighting," he says, puffing up his chest. He says he's certain he could shoot an Iraqi soldier, although he's never been in a conflict bigger than a schoolyard brawl.

"I don't know," I say. "I'd have trouble shooting some young kid who was being forced to fight."

"Not me. We're down to dog-eat-dog."

He nods at his frowning wife, who's anti-invasion. "All's fair in love and war." Then back to me. "You're not one of those peacenik softies, are you?"

"It wouldn't bother you to kill someone?"

"Not a bit."

"You're sure?"

“Absolutely.”

He’s a neighbor and I can’t escape. So I tell him one of my father’s favorite self-mocking stories.

During the 1930s and ’40s, my father had a pharmacy in one of the tougher areas of San Francisco. He kept a small revolver hidden beneath the back cash register. One night, a man approached, pulled out a knife, and demanded all the money in the register. My father reached under the counter, grabbed his gun, and aimed it at the robber.

“Drop it,” the robber said, his knife at my father’s throat. “You’re not going to shoot me, but I *will* kill you.”

For a moment it was a Hollywood standoff, *mano a mano*. Then my father put down his gun, emptied out the register, and handed over the money.

“What’s your point?” the lawyer asks. “Your father should have shot him.”

“Just the obvious,” I say. “You don’t always know what you’re going to do until you’re in the moment.”

“Sure you do. I know with absolute certainty that I’d shoot anyone who was threatening me.”

“No chance of any hesitation?”

“None at all. I know myself. I know what I would do. End of discussion.”

MY MIND REELS with seemingly impossible questions. What kind of knowledge is “I know myself and what I would do”? Is it a conscious decision based upon deep self-contemplation or is it a “gut feeling”? But what is a gut feeling—an unconscious decision, a mood or emotion, an ill-defined but clearly recognizable mental state, or a combination of all these ingredients? If we are to

understand how we know what we know, we first need some ground rules, including a general classification of mental states that create our sense of knowledge about our knowledge.

For simplicity, I have chosen to lump together the closely allied feelings of certainty, rightness, conviction, and correctness under the all-inclusive term, the *feeling of knowing*. Whether or not these are separate sensations or merely shades or degrees of a common feeling isn't important. What they do share is a common quality: Each is a form of metaknowledge—knowledge about our knowledge—that qualifies or colors our thoughts, imbuing them with a sense of rightness or wrongness. When focusing on the phenomenology (how these sensations *feel*), I've chosen to use the term the *feeling of knowing* (in italics). However, when talking about the underlying science, I'll use *knowing* (in italics). Later I will expand this category to include feelings of familiarity and realness—qualities that enhance our sense of correctness.

EVERYONE IS FAMILIAR with the most commonly recognized *feeling of knowing*. When asked a question, you feel strongly that you know an answer that you cannot immediately recall. Psychologists refer to this hard-to-describe but easily recognizable feeling as a tip-of-the-tongue sensation. The frequent accompanying comment as you scan your mental Rolodex for the forgotten name or phone number: "I know it, but I just can't think of it." In this example, you are aware of knowing something, without knowing what this sense of knowing refers to.

Anyone who's been frustrated with a difficult math problem has appreciated the delicious moment of relief when an incomprehensible equation suddenly *makes sense*. We "see the light." This *aha* is a notification from a subterranean portion of our

mind, an involuntary all-clear signal that we have grasped the heart of a problem. It isn't just that we can solve the problem; we also "know" that we understand it.

Most *feelings of knowing* are far less dramatic. We don't ordinarily sense them as spontaneous emotions or moods like love or happiness; rather they feel like thoughts—elements of a correct line of reasoning. We learn to add $2+2$. Our teacher tells us that 4 is the correct answer. Yes, we hear a portion of our mind say. Something within us tells us that we "know" that our answer is correct. At this simplest level of understanding, there are two components to our understanding—the knowledge that $2+2=4$, and the judgment or assessment of this understanding. We know that our understanding that $2+2=4$ is itself correct.

The *feeling of knowing* is also commonly recognized by its absence. Most of us are all too familiar with the frustration of being able to operate a computer without having any "sense" of how the computer really works. Or learning physics despite having no "feeling" for the rightness of what you've learned. I can fix a frayed electrical cord, yet am puzzled by the very essence of electricity. I can pick up iron filings with a magnet without having the slightest sense of what magnetism "is."

At a deeper level, most of us have agonized over those sickening "crises of faith" when firmly held personal beliefs are suddenly stripped of a visceral sense of correctness, rightness, or meaning. Our most considered beliefs suddenly don't "feel right." Similarly, most of us have been shocked to hear that a close friend or relative has died unexpectedly, and yet we "feel" that he is still alive. Such upsetting news often takes time to "sink in." This disbelief associated with hearing about a death is an example of the sometimes complete disassociation between intellectual and felt knowledge.

To begin our discussion of the *feeling of knowing*, read the following excerpt at normal speed. Don't skim, give up halfway through, or skip to the explanation. Because this experience can't be duplicated once you know the explanation, take a moment to ask yourself how you feel about the paragraph. After reading the clarifying word, reread the paragraph. As you do so, please pay close attention to the shifts in your mental state and your feeling about the paragraph.

A newspaper is better than a magazine. A seashore is a better place than the street. At first it is better to run than to walk. You may have to try several times. It takes some skill, but it is easy to learn. Even young children can enjoy it. Once successful, complications are minimal. Birds seldom get too close. Rain, however, soaks in very fast. Too many people doing the same thing can also cause problems. One needs lots of room. If there are no complications, it can be very peaceful. A rock will serve as an anchor. If things break loose from it, however, you will not get a second chance.

Is this paragraph comprehensible or meaningless? Feel your mind sort through potential explanations. Now watch what happens with the presentation of a single word: kite. As you reread the paragraph, feel the prior discomfort of something amiss shifting to a pleasing sense of rightness. Everything fits; every sentence works and has meaning. Reread the paragraph again; it is impossible to regain the sense of not understanding. In an instant, without due conscious deliberation, the paragraph has been irreversibly infused with a *feeling of knowing*.

Try to imagine other interpretations for the paragraph. Suppose

I tell you that this is a collaborative poem written by a third-grade class, or a collage of strung-together fortune cookie quotes. Your mind balks. The presence of this *feeling of knowing* makes contemplating alternatives physically difficult.

Each of us probably read the paragraph somewhat differently, but certain features seem universal. After seeing the word *kite*, we quickly go back and reread the paragraph, testing the sentences against this new piece of information. At some point, we are convinced. But when and how?

The kite paragraph raises several questions central to our understanding of how we “know” something. Though each will be discussed at greater length in subsequent chapters, here’s a sneak preview.

- Did you consciously “decide” that *kite* was the correct explanation for the paragraph, or did this decision occur involuntarily, outside of conscious awareness?
- What brain mechanism(s) created the shift from not knowing to *knowing*?
- When did this shift take place? (Did you know that the explanation was correct before, during, or after you reread the paragraph?)
- After rereading the paragraph, are you able to consciously separate out the *feeling of knowing* that *kite* is the correct answer from a reasoned understanding that the answer is correct?
- Are you sure that *kite* is the correct answer? If so, how do you know?

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How Do We Know What We Know?

PARENTS' AND TEACHERS' CUSTOMARY ADVICE FOR "NOT getting" math and physics is to study harder and think more deeply about the problem. Their assumption is that more effort will bridge the gap between dry knowledge and felt understanding. Without this assumption, we would give up every time we failed to understand something at first glance. But for those "what's the point of it all" existential moments—when formerly satisfactory feelings of purpose and meaning no longer "feel right"—history and experience have taught us differently. Logic and reason rarely are "convincing." (In this context, "convincing" is synonymous with reviving this missing *feeling of knowing* what life is about.) Instead, we conjure up images of ascetics, mystics, and spiritual seekers—those who have donned hair shirts, trekked through the desert à la St. Jerome, huddled in caves or under trees, or sought isolation and silence in monasteries. Eastern religions emphasize a "stillness of the mind" rather than actively thinking about the missing sense of meaning.

So, which is it? Should the remedy for the absence of the *feeling of knowing* be more conscious effort and hard thought, or less? Or are both of these common teachings at odds with more basic neurobiology? Consider the curious phenomenon of *blindsight*, perhaps the best-studied example of the lack of the *feeling of knowing* in the presence of a state of knowledge.

Out of Sight Is Not Out of Mind

A patient has a stroke that selectively destroys his occipital cortex—the portion of the brain that receives primary visual inputs. His retina still records incoming information, but his malfunctioning visual cortex does not register the images sent from the retina. The result is that the patient consciously sees nothing. Now flash a light in various quadrants of his visual field. The patient reports that he sees nothing, yet he can fairly accurately localize the flashing light to the appropriate quadrant. He feels that he is guessing and is unaware that he is performing any better than by chance.

How is this possible?

First, let's trace the pathway of the "unseen" light. Some fibers from the retina proceed directly to the primary visual cortex in the occipital lobe. But other fibers bypass the region responsible for conscious "seeing" and instead project to subcortical and upper brain stem regions that do not produce a visual image. These lower brain areas are primarily concerned with automatic, reflexive functions such as fight-or-flight. Quickly approaching or looming objects cause the body to swing the head into position so that the eyes can examine the threat. An immediate reflexive action has clear evolutionary benefits over more time-consuming conscious

perception and deliberation. In the broadest sense, you could say that these subcortical regions “see” the threat without sending a visual image into awareness.

Blindsight is a primitive unconscious visual localization and navigation system uncovered by the patient’s cortical blindness. The patient’s subliminal knowledge of the location of the flashing light doesn’t trigger the *feeling of knowing* because news of this knowledge can’t reach the higher cortical regions that generate the feeling. As a result, the patient swears that he hasn’t seen a flashing light, yet he clearly possesses a subliminal knowledge of the light’s location. When he chooses the proper visual field for the flashing light, he has no feeling that this is a correct answer. *He does not know what he knows.*¹

With blindsight, we see the disconnect between knowledge and awareness of this knowledge as being related to a fundamental flaw in our circuitry. This broken connection cannot be restored either through conscious effort or stilling of the mind—the problem is not within our control.

Though clinically apparent blindsight is a rare event usually caused by a stroke that interferes with the blood supply to the occipital cortex, faulty expressions of the *feeling of knowing* are everyday occurrences. Let’s begin with our own memories.

The Challenger Study

Try to remember where you were when Kennedy was assassinated, the *Challenger* blew up, or the World Trade Center was attacked. Now ask yourself how certain you are of those memories. If you believe that you are quite sure of where you were when you heard the news, keep that feeling in mind as you read about

the *Challenger* study in the next pages. If you don't remember where you were, ask yourself how you know that you don't remember. (Keep in mind the blindsight example when asking this question.) Either way, try to understand the feeling and your degree of certainty of this memory.

At my most recent med school reunion dinner, several former classmates were recalling where they were when Kennedy was assassinated. We had been in the second year of medical school, which meant that we all went to the same classes. Wherever one was, we probably all were. But the recollections were strikingly different; after dinner the discussion was becoming increasingly heated, as though each classmate's mind was on trial. A urologist thought we were at lunch, an internist said we were in the lab. A pathologist remembered being at a pub down the street from the med center. "That can't be true," the urologist said. "The assassination was at noon, Dallas time. You didn't go to the bars 'til after class."

I laughed and briefly described the *Challenger* study.²

Within one day of the space shuttle *Challenger* explosion, Ulric Neisser, a psychologist studying "flashbulb" memories (the recall of highly dramatic events), asked his class of 106 students to write down exactly how they'd heard about the explosion, where they were, what they'd been doing, and how they felt. Two and a half years later they were again interviewed. Twenty-five percent of the students' subsequent accounts were strikingly different than their original journal entries. More than half the people had lesser degrees of error, and less than ten percent had all the details correct. (Prior to seeing their original journals, most students presumed that their memories were correct.)

Most of us reluctantly admit that memory changes over time.

As kids, we saw how a story changed with retellings around a campfire. We have been at enough family reunions to hear once-familiar shared events morphed into unrecognizable and often contradictory descriptions. So, seeing that your journal entries were different than your recollection a couple of years later shouldn't be surprising. What startled me about the *Challenger* study were the students' responses when confronted with their conflicting accounts. Many expressed a high level of confidence that their false recollections were correct, despite being confronted with their own handwritten journals. The most unnerving was one student's comment, "That's my handwriting, but that's not what happened."

Why wouldn't the students consider their journal entries written shortly after the event to be more accurate than a recollection pulled up several years later? Pride, stubbornness, or fear of admitting an error? Not remembering the details of the *Challenger* explosion doesn't imply some massive personal failing that would make resistance to contrary evidence so overwhelming. Conversely, wouldn't pride in being logical and rational steer the students toward choosing their own handwriting over memories that they know might have been altered with time?

The inflamed urologist interrupted me, insisting the pathologist concede that he was wrong. The pathologist refused, turned to me, and said, "You tell them, Burton. You were there in the bar with me."

"Beats me. I just don't remember."

"That's not possible," the two warring doctors said simultaneously. "Everyone remembers the Kennedy assassination."

I shrugged and silently marveled at the vehemence of my classmates' convictions. Even telling them of the *Challenger* study

persuaded no one, as though they were intent upon reproducing the very study that questioned their recollections. All felt that they were right, that they absolutely *knew* where they were and what they were doing when Kennedy was assassinated.

Cognitive Dissonance

In 1957, Stanford professor of social psychology Leon Festinger introduced the term *cognitive dissonance* to describe the distressing mental state in which people “find themselves doing things that don’t fit with what they know, or having opinions that do not fit with other opinions they hold.”³ In a series of clever experiments, Festinger demonstrated that such tensions were more often minimized or resolved through changes in personal attitudes than by relinquishing the dissonant belief or opinion.

As an example, Festinger and his associates described a cult that believed that the earth was going to be destroyed by a flood. When the flood did not happen, those less involved with the cult were more inclined to recognize that they had been wrong. The more invested members who had given up their homes and jobs to work for the cult were more likely to reinterpret the evidence to show that they were right all along, but that the earth was not destroyed because of their faithfulness.⁴

Festinger’s seminal observation: The more committed we are to a belief, the harder it is to relinquish, even in the face of overwhelming contradictory evidence. Instead of acknowledging an error in judgment and abandoning the opinion, we tend to develop a new attitude or belief that will justify retaining it. By giving us a model to consider how we deal with conflicting values, the theory of cognitive dissonance has become one of the most

influential theories in social psychology. Yet it fails to convincingly answer why it is so difficult to relinquish unreasonable opinions, especially in light of seemingly convincing contrary evidence. It is easy to dismiss such behavior in cult members and others “on the fringe,” but what about those of us who presume ourselves to be less flaky, those of us who pride ourselves on being levelheaded and reasonable?

WE MIGHT THINK of the *Challenger* study as an oddity, but here are additional examples of consciously choosing a false belief because it *feels* correct even when we know better. I have chosen the first example as a prelude to a later discussion in chapter 13 of the deeply rooted biological component of the science-versus-religion struggle. The second example, highlighting the cognitive dissonance of the placebo effect, introduces the idea that an unjustified *feeling of knowing* can have a clear adaptive benefit.

A Scientist Contemplates Creationism

Kurt Wise, with a B.A. in geophysics from the University of Chicago, a Ph.D. in geology from Harvard, where he studied under Steven Jay Gould, and a professorship at Bryan College in Dayton, Tennessee, writes of his personal conflict between science and religion.⁵

I had to make a decision between evolution and Scripture. Either the Scripture was true and evolution was wrong or evolution was true and I must toss out the Bible. . . . It was there that night that I accepted the Word of God and rejected all that would ever

counter it, including evolution. With that, in great sorrow, I tossed into the fire all my dreams and hopes in science. . . . *If all the evidence in the universe turns against creationism, I would be the first to admit it, but I would still be a creationist because that is what the Word of God seems to indicate.* (Italics mine.)

A Patient Confronts the Placebo Effect

In a study of 180 people with osteoarthritis of the knee, a team of Houston surgeons headed by Bruce Moseley, M.D., found that patients who had “sham” arthroscopic surgery reported as much pain relief and improved mobility as patients who actually underwent the procedure.⁶

Mr. A, a seventy-six-year-old retired World War II veteran with a five-year history of disabling knee pain from X-ray-documented degenerative osteoarthritis was assigned to the placebo group (sham surgery in which general anesthesia was given, superficial incisions were made in the skin over the knee, but no actual surgical repair was performed). After the procedure, Mr. A was informed that he had received sham surgery; the procedure was described in detail. Nevertheless, he dramatically improved; for the first time in years he was able to walk without a cane. When questioned, he both fully understood what sham surgery meant and fully believed that his knee had been fixed.

“The surgery was two years ago and the knee has never bothered me since. It’s just like my other knee now. I give a whole lot of credit to Dr. Moseley. Whenever I see him on the TV, I call the wife in and say, ‘Hey, there’s the doctor that fixed my knee!’ ”⁷

Our creationist geologist cringes at his own irrationality and yet

declares that he does not have a choice. A patient “knows” that he hasn’t had any reparative surgery performed, yet insists that the doctor fixed his knee. What if we could find patients who developed similar difficulties with reason as the result of specific brain insults (lesions)? If brain malfunctions can produce a similar flawed logic, what might that tell us about the biological underpinnings of cognitive dissonances?

Cotard’s Syndrome

Ms. B, a twenty-nine-year-old grad student hospitalized for an acute viral encephalitis (a viral inflammation of the brain) complained: “Nothing feels real. I am dead.” The patient refused any medical care. “There is no point in treating a dead person,” she insisted. Her internist tried to reason with her. He asked her to put her hand on her chest and feel her heart beating. She did, and agreed that her heart was beating. He suggested that the presence of a pulse must mean that she was not dead. The patient countered that, since she was dead, her beating heart could not be evidence for being alive. She said she recognized that there was a logical inconsistency between being dead and being able to feel her beating heart, but that being dead felt more “real” than any contrary evidence that she was alive.

Weeks later, Ms. B began to recover; eventually she no longer believed that she was dead. She was able to make a distinction between her recovered “reality” and her prior delusions, yet she continued to believe that it must be possible to feel one’s heart beat after death. After all, it had happened to her.

Cotard’s syndrome—*le délire de négation*—is attributed to a French psychiatrist, Jules Cotard, who in 1882 described several

patients with delusions of self-negation. These ranged from the belief that parts of the body were missing, or had putrefied, to the complete denial of bodily existence. The syndrome has been described with a variety of brain injuries, strokes, and dementia, as well as severe psychiatric disorders. The most extraordinary element of the syndrome is the patient's unshakable belief in being dead that overpowers any logical counterconclusion. Feeling one's beating heart isn't sufficient evidence to overcome the more powerful sense of the reality of being dead.

Other delusional syndromes associated with acute brain lesions include believing that a friend or a relative has been replaced by an impostor, or a double, or has taken on different appearances or identities, or that an inanimate object has been replaced by an inferior copy. The clinical feature common to all of these syndromes is the inability of the patient to shake a belief that he logically knows is wrong.

Mr. C, an elegant retired art dealer, was hospitalized overnight with a small stroke. The next morning, he felt well and was discharged. Within moments of returning home, he phoned my office in a panic. He was certain that his favorite antique desk had been replaced by a cheap Levitz reproduction. "Hurry over and see for yourself." He lived near my office; I dropped by at lunchtime. The desk in question was a massive eighteenth-century Italian refectory table that took up most of his den. It could easily seat a dozen; just lifting it would require a minimum of several men. And it was far too wide to fit through the doorway without removing the French doors. I quickly pointed out the impossibility of someone sneaking in, moving out the desk, and substituting a fake. Mr. C shook his head. "Yes, I admit that it is physically impossible that the desk has been replaced. But it has. You have to

take my word for it. I know real when I see real, and this desk isn't real." He ran his hand along the grain, repeatedly fingering a couple of prominent wormholes. "It's funny," he said with a puzzled expression. "These are exact replicas of the holes in my desk. But they don't feel the least bit familiar. No," he announced emphatically, "someone must have replaced it." He then delivered the cognitive checkmate: "After all, I know what I know."

Although not restricted to a single area of the brain or a single definitive physiology, the most striking shared characteristic of these *delusional misidentification syndromes* is that the conflict between logic and a contrary *feeling of knowing* tends to be resolved in favor of feeling. Rather than rejecting ideas and beliefs that defy common sense and overwhelming contrary evidence, such patients end up using tortured logic to justify the more powerful sense of *knowing what they know*.⁸

Mr. C's statements also point out that *knowing* may also involve additional hard-to-define mental states such as a sense of familiarity and feelings of "realness." Like the tip-of-the-tongue sensation or the feeling of *déjà vu*, a sense of being familiar suggests some prior experience or knowledge. When stumped on a multiple choice test question, we tend to choose the answer that feels most familiar. Though we have no justification, we presume that such answers are more likely to be correct than those that we don't recognize or seem unfamiliar. Mr. C's "I know real when I see real" points out how a sense of "realness" might also bias us toward believing that an idea is correct. Patients with delusional misidentification syndromes often use "correct" interchangeably with "real."

It is likely that Mr. C's stroke affected his ability to appropriately

experience feelings of familiarity and “realness.” When neither the sight nor the feel of the desk triggered these feelings, he was forced to conclude that this desk could not be the original. Such delusions might be seen as an attempt to resolve a cognitive dissonance between hard evidence (the table is too big to move) and the absence of any feeling of familiarity and realness when Mr. C examined his desk.

In chapter 3 we shall see that the mental states of familiarity, “realness,” conviction, truth, *déjà vu*, and tip of the tongue share a similar physiology with the *feeling of knowing*, including the ability to be directly triggered with electrical stimulation of the brain’s limbic system.

It May Be Right, But It’s Not *Right*

The other day, at a downtown garage, I left my car with valet parking. I returned, started to drive away, but felt something was wrong. I questioned the attendant’s gaze, wondering if I’d paid too much. I checked the gas and oil gauge, and whether one of the doors was ajar. Then I realized that the seat had been readjusted by the attendant. It was a nominal difference, the seat was at most a half inch higher than usual. My *derriere* knew immediately; it took me considerably longer.

I was reminded of a story attributed to Ludwig Wittgenstein.

A man walks into a tailor’s shop. The sign over the front door reads: CUSTOMER SATISFACTION GUARANTEED. The man orders a custom-made suit that should fit exactly like the one he is wearing. The tailor painstakingly measures every detail and jots them down in a notebook. A week later the customer returns to try on the new suit.

"It's not right," the customer says with annoyance. . . .

"Of course it is," the tailor says. "Here, I'll show you." The tailor takes out his measuring tape, compares the suit's readings with those in his notebook. "See, they're identical."

The customer shifts in his new suit but is still uncomfortable and displeased. "It may be right, but it's not *right*." He refuses to pay for the suit and storms out.

In the case of my car seat, I was forced to think through all the possible reasons that I sensed something was wrong. Fortunately, there was something measurable (the new angle of the car seat) that *explained* what I was *feeling*. With the tailor example, the customer's sense of something amiss is a matter of taste, of inexpressible or subconscious aesthetics. No matter what the measurements, the suit does not *feel* right.

The tailor demands his money; the customer admits that the suit was to his specifications, but not to his liking, and therefore he is under no obligation to buy the suit. Each *feels* that he is right. Hence that irritating popular refrain—end of discussion. We often talk about gut feelings. There is now extensive literature on the neuroenteric brain, as though some form of thought might actually originate in the pit of your stomach. Maybe so. And maybe my body just *knew* that my car seat was out of whack. But whatever the origin of the sensation, the key feature is that there seems to be an underlying *sense* or *feeling* that something is either correct or incorrect.

Consider the similarity in tone between the *Challenger* study student who said, "That's my writing, but that's not what happened," and the suit customer's "It might be right, but it's not *right*." When such a sense of conviction overrides obvious logical inconsistencies or scientific evidence, what is happening? Is it possible that

there is an underlying neurophysiological basis for the specific sensation of *feeling right* or of *being right* that is so powerful that ordinary rational thought *feels* either wrong or irrelevant? Conviction versus knowledge—is the jury rigged, the game fixed by a basic physiology hidden beneath awareness?

Conviction Isn't a Choice

It is no great accomplishment to hear a voice in your head. The accomplishment is to make sure that it is telling you the truth.

—A patient describing a near-death experience

THE STUDIES OF BLINDSIGHT DEMONSTRATE THAT KNOWLEDGE and the awareness of this knowledge arise from separate regions of the brain. So, we should also be able to find clinical examples of the converse of blindsight—moments of abnormal or altered brain function when the expression of the *feeling of knowing* occurs in the absence of any knowledge.

Of course, at first glance, the very idea of an isolated *feeling of knowing* seems ludicrous. A sense of knowledge, to have any meaning, must refer to something “known.” We know “something,” not “nothing.” To dispel this notion that a *feeling of knowing* must be attached to a thought, this chapter will briefly touch on such seemingly unrelated phenomena as spontaneous and chemically induced religious experiences, Dostoyevsky’s epileptic aura, as well as detailed temporal lobe stimulation studies.

To experience the range of these states of *knowing* unassociated with any specific knowledge, let’s begin with the century-old classic—the *Varieties of Religious Experience* by William James—

which, for me, remains one of the most elegant testimonials to the power of clinical observations to explore the mind. James offers these illuminating quotes followed by his own comments (*italics in these excerpts are mine*).

Alfred Lord Tennyson:

I have never had any revelations through anesthetics, but a kind of waking trance—this for lack of a better word—I have frequently had, quite up from boyhood, when I have been all alone. This has come upon me through repeating my own name to myself silently, till all at once, as it were out of the intensity of the consciousness of individuality, individuality itself seemed to dissolve and fade away into boundless being, and *this not a confused state but the clearest, the surest of the surest, utterly beyond words*. . . . By God Almighty! There is no delusion in the matter! *It is no nebulous ecstasy, but a state of transcendent wonder, associated with absolute clearness of mind*.¹

Saint Teresa:

One day, it was granted me to perceive in one instant how all things are seen and contained in God. I did not perceive them in their proper form, and nevertheless the view I had of them was of a sovereign clearness, and has remained vividly impressed upon my soul. . . . The view was so subtle and delicate that the understanding cannot grasp it.²

James's summary opinion:

Personal religious experience has its root and centre in mystical states of consciousness. . . . Its quality must be directly experi-

enced; it cannot be imparted or transferred to others. In this peculiarity, mystical states are more like states of feeling than like states of intellect. . . . *Although so similar to states of feeling, mystical states seem to those who experience them to be also states of knowledge.* They are states of insight into depths of truth unplumbed by the discursive intellect. They are illuminations, revelations, full of significance and importance, all inarticulate though they remain; and as a rule they carry with them a curious sense of authority for after-time.³

This is a brilliant observation, equating religious and mystical states with the sensation of *knowing*, and with the further recognition that such knowledge is felt, not thought. Though lacking in modern-day neuroscience techniques, James was able to put his finger directly on a key feature of how we know what we know: “Mystical truth . . . resembles the knowledge given to us in sensations more than that given by conceptual thought.”⁴

James’s description is perfectly straightforward—with mystical states, people experience spontaneous mental sensations that feel like knowledge but occur in the absence of any specific knowledge. Felt knowledge. Knowledge without thought. Certainty without deliberation or even conscious awareness of having had a thought.

Neurotheology

In James’s time, speculations on the cause of religious epiphanies fell into two major camps: the psychological—hysteria, conversion reaction, schizoid personality disorder, and so on—or the spiritual, with claims of direct revelation from a higher power. Now we are increasingly hearing of a third possibility. Recent neurophysiological

studies suggest that such feelings arise directly from the activation of localized areas of the brain (the limbic system)—either spontaneously or as the result of direct stimulation. According to UCLA neurologist Jeffrey Saver, this is the most compelling explanation for the mystical experiences of Saint Paul, Mohammad, Emanuel Swedenborg, Joseph Smith, Margery Kempe, Joan of Arc, and Saint Teresa.⁵ The passage most commonly cited by neurologists is from a journal entry of Dostoyevsky. Though we lack pathological confirmation, the nature of Dostoyevsky's seizures is typical of seizures arising from disorders of the temporal lobe–limbic system structures.

On Easter eve night, circa 1870, Dostoyevsky is talking with a friend about the nature of God. Suddenly he cries out, “God exists; he exists.” Then he loses consciousness, experiencing an epileptic fit. Dostoyevsky later wrote in his journal:

I felt that heaven was going down upon the earth and that it had engulfed me. I have really touched God. He came into me myself, yes. You all, healthy people, can't imagine the happiness which we epileptics feel during the second before our fit. . . . I don't know if this felicity last for seconds, hours or months, but believe me, for all the joys that life may bring, I would not exchange this one.⁶

Ecstatic bliss triggered solely by wayward electrons? Why not? If you accept the studies of Toronto psychologist Michael Persinger, the same effect can be created with external stimulation of the brain. Volunteers don a cloth swimmer's cap outfitted with a grid of magnetic coils. Using the magnets to stimulate localized areas of the brain, Persinger has been able to generate feelings of a “sensed

presence,” “another self,” or “oneness with the universe” (actual patient descriptions). Those with a Christian upbringing often describe the presence of Jesus; those with Muslim backgrounds have described the presence of Mohammad. Also frequently mentioned are profound emotions such as awe, joy, and a general sense of harmony and deep significance—though without being attached to any specific idea or belief.

It isn't surprising that there is an ever-growing literature on the biological origin of the religious impulse, for example, *Why God Won't Go Away* and *The “God” Part of the Brain*, or that my mailbox is stuffed with invites to weekend conferences on “neurotheology.” The underlying point is both profound and self-evident: Even if the origination of the sense of God were extracorporeal—from a distant black hole, a past life, a dead relative, the rings around Uranus, or God in his or her heaven—the final pathway for the message's perception must reside within the brain.

Chemical activation of mystical states is as old as the most ancient psychedelic. William James described the phenomena with several anesthetics—chloroform, ether, and nitrous oxide. The following chloroform-induced mystical experience is a good example of a chemically induced cognitive dissonance: The knowledge that the mystical experience is a result of mundane chemistry does not negate the nagging (and lingering) sense of the certainty of God's existence. Note also that chloroform evoked the sensations of purity and truth *without any reference to any specific idea or thought*.

I cannot describe the ecstasy I felt. Then, as I gradually awoke from the influence of the anesthetics, the old sense of my relation to the world began to return, and the new sense of my relation to

God began to fade. . . . Think of it. To have felt purity and tenderness and truth and absolute love, and then to find that I had after all had no revelation, but that I had been tricked by the abnormal excitement of my brain. *Yet, this question remains. Is it possible that the inner sense of reality . . . was not a delusion, but an actual experience? Is it possible that I felt what some of the saints have said that they always felt, the undemonstrable but indisputable certainty of God?*⁷ (Italics mine.)

In the following ether-induced example, another subject confirms the power of the mystical experience to feel as if a greater knowledge than objective evidence: "In that moment the whole of my life passed before me, including each little meaningless piece of distress, and I understood them. This was what it had all meant, this was the piece of work it had all been contributing to do. . . . *I perceived also in a way never to be forgotten, the excess of what we see over what we can demonstrate.*"⁸ (Italics mine.)

Volunteers undergoing intravenous ketamine infusions (an anesthetic molecularly similar to the street drug PCP or angel dust), frequently experience a profound clarity of thought. One subject described "a sense of understanding everything, of knowing how the universe works."⁹ Such descriptions are quite similar to those who've had "near-death experiences" from a cardiac arrest or an anesthetic complication; indeed, there may be a common mechanism of action.¹⁰ Lack of adequate brain oxygen characteristically triggers the release of the neurotransmitter glutamate. Under normal conditions glutamate binds to NMDA receptors; in excessive amounts it is neurotoxic and facilitates neuronal death. In an attempt to prevent this cell death, the oxygen-deprived brain also releases protective chemicals that block the effect of

glutamate on NMDA receptors. Ketamine has a similar NMDA receptor-blocking effect. So does MDMA (Ecstasy), another psychoactive drug known to produce feelings of mental clarity.¹¹ It is now believed that this blocking of the NMDA receptor is responsible for the clinical picture of a near-death experience.

Voices from the Limbic System

With each of the earlier descriptions, we are at the mercy of brief, highly emotionally charged, and difficult to reproduce patient reactions. Fortunately, we have a more consistent, controlled, and reproducible method for eliciting these mental states of *knowing*—formal brain stimulation/mapping of the temporal lobe–limbic system. As we proceed, keep in mind that brain mapping is the same technique that neurologists have used to localize other primary brain functions such as motor movements, vision, and hearing. But first, a word about the limbic system.

Though some neuroscientists question its existence as a specific entity,¹² the term *limbic system* is useful for discussing those regions of the brain fundamental to the most primary and basic emotions.¹³ It includes the evolutionarily oldest regions of the cortex and subcortex—the cingulate gyrus, amygdala, hippocampus, the hypothalamus, and a variety of basal forebrain structures including the ventral tegmental area (the site of the brain's primary reward system), as well as associated regions of the frontal cortex that are implicated in emotional responses and decision making.¹⁴

Unfortunately for lab animals, the easiest emotion to study is good old-fashioned terror. Enter Joseph LeDoux, professor of neuroscience at New York University, with his provocative and

ingenious series of experiments. LeDoux conditioned rats to associate the sound of a ringing bell with electric shocks applied to their paws. After being conditioned, the sound of the bell, without the electric shocks, was sufficient to provoke a typical fear response—momentary cessation of body movement, change in heart rate, blood pressure, sweating, and release of stress hormones.¹⁵ LeDoux set out to find out the pathways that produced this fear response.

He found that cutting the rats' acoustic nerves—the neural connection between the ears and the brain—abolished the fear response. (The sound of the bell didn't reach the brain.) If he left the nerves intact, but surgically removed the auditory cortex—the region of brain that processes and creates the conscious awareness of sounds—the rats no longer “heard” the sound, yet the fearful behavior persisted.¹⁶ Just as the phenomenon of blindsight is based upon visual images being transmitted to and processed in areas other than the visual cortex, LeDoux surmised that the sound of the bell reached areas of subcortical brain capable of triggering the fear response without the rat consciously hearing the bell. LeDoux was able to demonstrate the presence of neural pathways that bypass the auditory cortex, connecting directly with a temporal lobe structure—the amygdala—long known to be crucial to the recognizing, processing, and remembering of emotional reactions, including the fear response. From the amygdala these nerve fiber pathways continue to regions of the hypothalamus that control the sympathetic nervous system leading to increased heart rate, blood pressure, and sweating, as well as to regions of the brain stem that control reflexes and the facial expressions of fear.

LeDoux's experiments greatly clarified the role of the amygdala in evoking a fear response without the need for any conscious

awareness and recognition of the provoking stimulus.¹⁷ Other experiments have confirmed that direct stimulation of the amygdala produces the same fear response as Ledoux's conditioning experiments. Conversely, bilateral removal of the amygdala in animals, from rats to monkeys, produces a state of utter fearlessness. Knocking out a single gene active in the amygdala can greatly diminish the fear response in rats.

This fearlessness has also been observed in those rare patients with bilateral amygdala damage. Such patients characteristically approach new and potential risky situations with a positive, unafraid attitude. One man with bilateral amygdala damage loved to hunt deer in Siberia while dangling from a helicopter. Another extensively studied patient, SM, a young woman with calcification and atrophy of both amygdalae, could not be startled by the unexpected blast of a 100 decibel boat horn. Despite repeated conditioning attempts, SM did not demonstrate any autonomic changes—such as rise in pulse or blood pressure.¹⁸ According to Antonio Damasio, the behavioral neurologist who has extensively investigated her deficits, SM can intellectually discuss what fear is, but the bilateral damage to her amygdala has prevented her from learning the significance of potentially dangerous situations.¹⁹ (In chapter 9, we will return to the amygdala's role in processing and creating memories of fearful events.)

As the result of such studies, neurologists now accept that the amygdala is necessary for the expression of fear. But the study of mental states that defy precise classification—such as *déjà vu* or a sense of dread—is much more difficult. We have problems both in what to call them and how to standardize our observations. It is easy to recognize a scared rat, but a rodent's sense of alienation is less obvious. As a consequence, there are few formal and systematic

studies; the closest that we have are the informal investigations carried out during the evaluation of patients with a particular form of epilepsy that originates from temporal lobe–limbic structures.

Most commonly as the result of a birth injury and developmental abnormalities, and occasionally due to a tumor, a patient can develop a particular form of epilepsy—a complex partial seizure. These spontaneous electrical discharges from temporal lobe–limbic structures characteristically produce a transient (seconds to minutes) alteration or clouding of consciousness, often associated with the intrusion of other mental feelings—*déjà vu*, dread, fear, and even religious feelings such as those described by Dostoyevsky. Their intensity varies from brief lapses in awareness to a complete loss of consciousness and major convulsions. The frequency also varies greatly. Some patients have very few seizures that are completely controlled with medication; others less fortunate can experience upwards of several dozen seizures per day despite maximal medication.

For the latter group, surgical removal of the damaged area of temporal lobe can result in a striking reduction or a cessation of seizures. As the major risk of surgery is creating damage to adjacent vital areas, the operating neurosurgeon must first identify the functions of all surrounding brain tissue. The surgery can be performed under local anesthesia (the brain is insensitive to pain); patients remain conscious and are able to describe exactly what they are experiencing. The surgeon systematically stimulates small areas of cerebral cortex; patient responses are recorded. At the conclusion of this cortical mapping, the surgeon has an excellent correlation between brain anatomy and its function and can better avoid operating near critical areas.

For our discussion, I've chosen three detailed series of operative

brain mapping—temporal lobe stimulations that provide the most in-depth patient descriptions. To avoid possible cultural bias, I've included studies of patients from Canada, France, and Japan.²⁰ Despite the obvious differences in background, culture, and language, the similarities remain striking. Though I've grouped patient descriptions according to general categories of experience, there is some degree of obvious overlap. Also, many of these "feelings" occur either concomitantly or in rapid succession. I have also included some descriptions of the patient's spontaneous seizures. Cortical stimulations are labeled CS; spontaneous seizures are labeled SZ. Each description is from a different patient. All italics are mine.

As you listen to these voices of the limbic system, keep in mind that what these patients describe is not dependent upon any specific antecedent thought, line of reasoning, mood, personality quirk, or circumstance. A jolt of electricity is all that is necessary.

Déjà Vu and Feelings of Familiarity

SZ: "I do not know where it is, but *it seems very familiar* to me. . . . I feel very close to an attack—I think I am going to have one—a familiar memory."

CS: "I have the impression of already having been here, that I had already lived through this."

SZ: "Patient stated that a thought entered his head which he seemed to have had before. It was something he had heard, felt, and thought in the past. . . . He was unable to describe it."

SZ: "Suddenly, the patient experiences a sensation of recollection, which feels like a scene she had experienced somewhere in the past. She feels as if she has seen something familiar. As she tries to recall what it is, she feels a sense of pleasure."

The authors comment: "*In this description, the familiarity is dissociated from memory and 'the feeling of knowing' appears in mind.*"²¹

Jamais Vu and Other "Feelings of Strangeness"

CS: "I had a dream—I wasn't here. . . . I sort of lost touch with reality. . . ." Stimulation was repeated at the same site. "A small feeling like a warning." The stimulation was again repeated. "I was *losing touch with reality* again."

SZ: "He had a sensation of '*strangeness of words*' as if he had never seen or heard them before."

SZ: "His aura begins with a sense that *objects look bizarre*, and that speech, although understood, *sounds strange* in an indefinable way."

CS: "*Things are deformed. . . . I am another person and I seem to be somewhere else.*" The patient also described anguish with a feeling of imminent death.

CS: "From the age of thirty-five, the patient has suddenly and transiently felt as if she were *falling into another, and fearful, world.*"

CS: "He felt himself *alone in another world*, and he felt fearful."

SZ: "When he has an attack in his own room, he feels as if *his room has been changed and has become strange.*"²²

Strangely Familiar—a Duet of Opposites

Descriptions that include simultaneous feelings of familiarity and strangeness:

SZ: "A brief 'dream' without loss of consciousness, where suddenly he had a very strong memory of a scene that he has already lived through, that nonetheless *feels bizarre*. Later, the scene was

preceded by 'the impression of having already done what I am in the process of doing; it seems to me that I have already lived through the entire situation; with a *feeling of strangeness* and often of fear.'"

SZ: "Begins with a feeling of fear, then an indefinable *internal feeling of strangeness, sometimes associated with the emergence of old or recent memories* (presented more as thoughts than as sensory images)."

SZ: "Begins with a *very agreeable aesthetic illusion*. . . . that would appear to him as if it were *magnificent*, giving him *great pleasure*. At about the same time, *intense thoughts would come to him, which he would accept uncritically*; it could be a voice, like in a dream—he *thinks that someone wished him harm, that people are saying bad things about him, but at the same time he takes pleasure from this*."

SZ: "Begins with a feeling of discomfort and epigastric constriction; a *feeling of strangeness and unreality of the environment*, with a vague feeling of *déjà vécu*; then loss of contact.

"I am in a small village where everyone knows each other. . . . I had the impression of having seen those people, and I felt something in the stomach, like a ball . . . that which I saw, could have been anything. It's more like an idea than an image that was presented rapidly in a very fleeting manner; *some strange thing, without relation to reality*, moving, but not necessarily, with lifelike colors."

SZ: "Begins with an indefinable feeling of fear, sometimes associated with an internal whispering voice and then an *intensely painful emotional state with a familiar resonance, 'like the memory of an emotion.'*"

MY AIM IN presenting these detailed descriptions is not to categorically identify the limbic system as the sole site of origin

of the feelings such as familiarity, realness, “knowing,” clarity of thought, and so on, but to show how these feelings that qualify how we experience our thoughts can be elicited both chemically and electrically without any antecedent triggering thought or memory. Familiar and real aren’t conscious conclusions. Neither are strange and bizarre. They are easily elicited without any associated reasoning or conscious thought. But what exactly are these “mental states”? A word of clarification is in order.