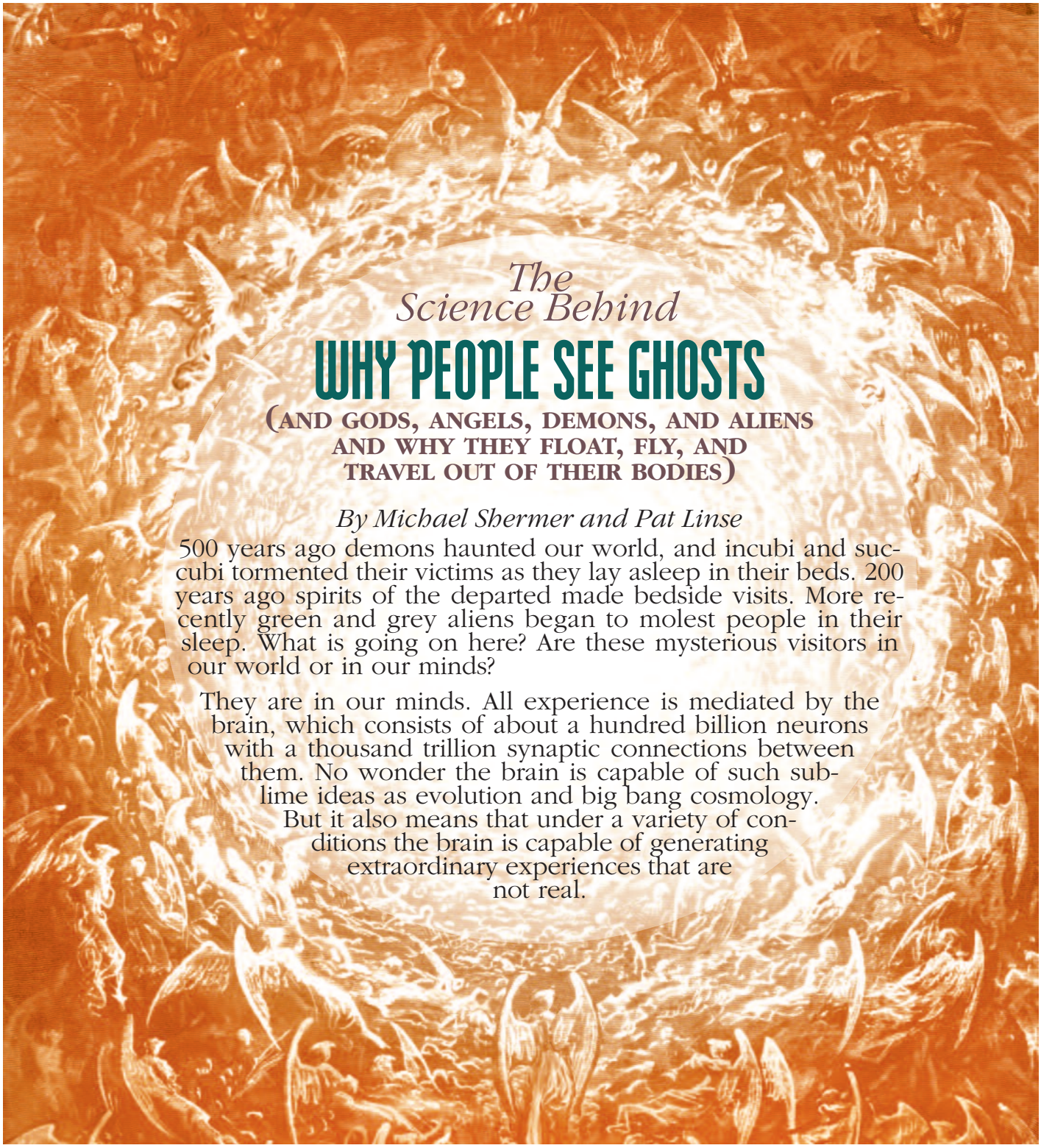


The Science Behind

WHY PEOPLE SEE GHOSTS

(AND GODS, ANGELS, DEMONS, AND ALIENS AND WHY THEY FLOAT, FLY, AND TRAVEL OUT OF THEIR BODIES)

By Michael Shermer and Pat Linse

500 years ago demons haunted our world, and incubi and succubi tormented their victims as they lay asleep in their beds. 200 years ago spirits of the departed made bedside visits. More recently green and grey aliens began to molest people in their sleep. What is going on here? Are these mysterious visitors in our world or in our minds?

They are in our minds. All experience is mediated by the brain, which consists of about a hundred billion neurons with a thousand trillion synaptic connections between them. No wonder the brain is capable of such sublime ideas as evolution and big bang cosmology. But it also means that under a variety of conditions the brain is capable of generating extraordinary experiences that are not real.

1 PSYCHOACTIVE DRUGS

The ability of hallucinogenic drugs to trigger preternatural experiences are well documented. A sense of floating and flying may be stimulated by atropine and other belladonna alkaloids, which are found in mandrake or jimson weed and were used by European witches and Native American shamans, probably for this very purpose. Dissociative anesthetics such as the ketamines are known to induce out-of-body experiences. Ingestion of methylenedioxyamphetamine (MDA) may bring back long-forgotten memories and produce the feeling of age regression, while di-methyl-tryptamine (DMT)—AKA "the spirit molecule—causes the dissociation of the mind from the body and is the hallucinogenic substance in *ayahuasca*, a drug taken by South American shaman. People taking DMT report "I no longer have a body," and I am "falling," "flying," or "lifting up."

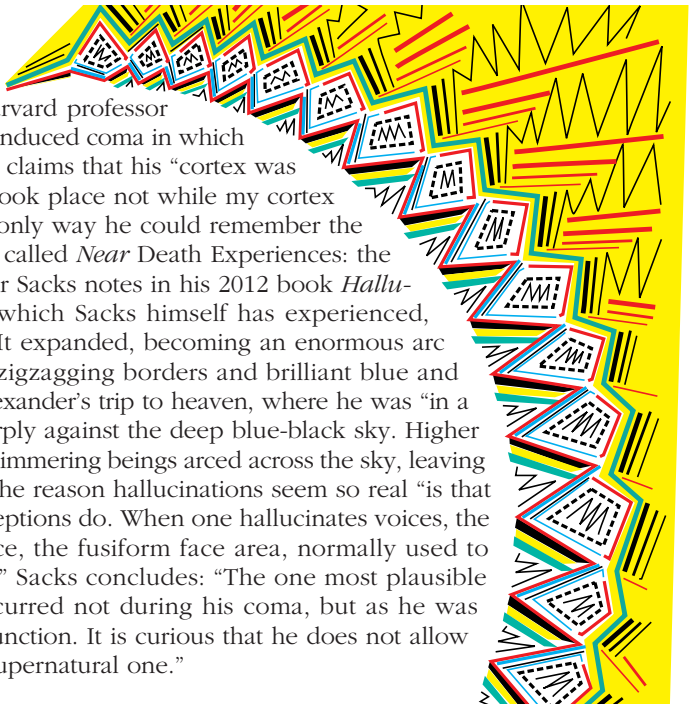
2 MEDITATION

In the 2001 book *Why God Won't Go Away*, neuroscientist Andrew Newberg reported that brain scans made of meditating Buddhist monks and praying Franciscan nuns indicate strikingly low activity in the *posterior superior parietal lobe*, a region of the brain the authors have dubbed the Orientation Association Area (OAA). The OAA's job is to orient the body in physical space, and people with damage to this area have a difficult time negotiating their way around a house, sometimes even bumping into objects because their brain does not process the object as something separate from their body. When the OAA is booted up and running smoothly there is a sharp
distinction between self and non-self. When OAA is in sleep mode—as in deep
meditation and prayer—that division breaks down, leading to a blurring of the lines between reality and fantasy, and between feeling in body and out of body. Perhaps this is what happens to monks who experience a sense of oneness with the universe, or with nuns who feel the presence of God, or with alien abductees who float up out of their beds to join with the mother ship.

3 BRAIN DAMAGE

he renowned neurologist Oliver Sacks, best known for his remarkable work in "awakening" the catatonic brains of encephalitis victims as portrayed in the popular 1990 film *Awakenings* (starring Robin Williams as Sacks), has written a number of books describing the bizarre hallucinations experienced by his patients—such as the man who mistook his wife for a hat—which are inevitably interpreted by the experiencers as external to their brain. One elderly patient who suffered from macular degeneration and had completely lost her vision was diagnosed by Sacks with Charles Bonnett Syndrome because of her suite of complex visual hallucinations, including and especially faces with distorted teeth and eyes. Another patient developed a tumor in her visual cortex and soon after began hallucinating cartoons—most memorably Kermit the Frog—that were transparent and covered only half of her visual field. In fact, says Sacks, about 10% of visually impaired people experience visual hallucinations. Brain scans of hallucinating patients show that the visual cortex is activated during these phantasms. During geometric hallucinations it is the primary visual cortex that is most active—the part of the brain that perceives patterns (but not images). Hallucinations that include images such as faces are associated with more activity in the temporal lobe's *fusiform area* in the temporal lobe, which is involved in the recognition of faces (people with damage to this area cannot recognize faces, and stimulation of the area causes people to spontaneously see faces).

4 COMAS

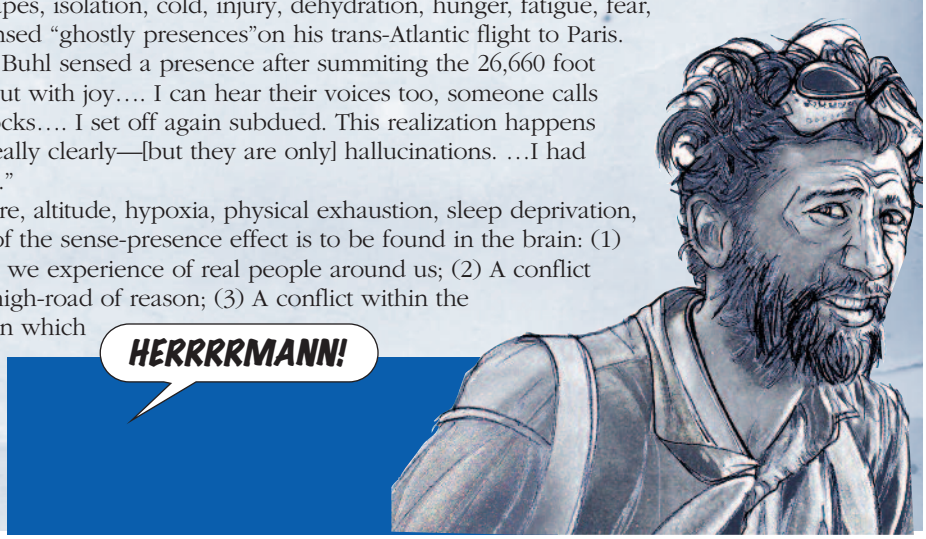


In Eben Alexander's bestselling book *Proof of Heaven*, the Harvard professor recounts his Near-Death Experience (NDE) during a meningitis-induced coma in which he says he went to heaven. Did he? Not likely. First, Alexander claims that his "cortex was completely shut down" and that "My near-death experience…took place not while my cortex was malfunctioning, but while it was simply off." And yet the only way he could remember the experience is if his brain was *on*. And there's a reason they're called *Near* Death Experiences: the people who have them are not actually dead. As well, as Oliver Sacks notes in his 2012 book *Hallucinations,* migraine headaches also produce hallucinations, which Sacks himself has experienced, including a "shimmering light" that was "dazzlingly bright": "It expanded, becoming an enormous arc stretching from the ground to the sky, with sharp, glittering, zigzagging borders and brilliant blue and orange colors." Compare Sacks' experience to that of Eban Alexander's trip to heaven, where he was "in a place of clouds. Big, puffy, pink-white ones that showed up sharply against the deep blue-black sky. Higher than the clouds—immeasurably higher—flocks of transparent, shimmering beings arced across the sky, leaving long, streamerlike lines behind them." Dr. Sacks explains that the reason hallucinations seem so real "is that they deploy the very same systems in the brain that actual perceptions do. When one hallucinates voices, the auditory pathways are activated; when one hallucinates a face, the fusiform face area, normally used to perceive and identify faces in the environment, is stimulated." Sacks concludes: "The one most plausible hypothesis in Dr. Alexander's case, then, is that his NDE occurred not during his coma, but as he was surfacing from the coma and his cortex was returning to full function. It is curious that he does not allow this obvious and natural explanation, but instead insists on a supernatural one."

5 SENSED PRESENCE EFFECT

There is a phenomenon well-known among mountain climbers, polar explorers, isolated sailors, and endurance athletes called the *sensed-presence effect*—the sense that someone or something else is with us. Conditions associated with a sensed presence include: monotony, darkness, barren landscapes, isolation, cold, injury, dehydration, hunger, fatigue, fear, and sleep deprivation. Charles Lindbergh sensed "ghostly presences"on his trans-Atlantic flight to Paris. The famous Austrian mountaineer Hermann Buhl sensed a presence after summiting the 26,660 foot Nanga Parbat: "…I see two dots. I could shout with joy…. I can hear their voices too, someone calls 'Hermann,' but then I realize that they are rocks…. I set off again subdued. This realization happens frequently. …I hear voices, hear my name really clearly—[but they are only] hallucinations. …I had an extraordinary feeling that I was not alone."

Whatever its immediate cause (temperature, altitude, hypoxia, physical exhaustion, sleep deprivation, starvation, loneliness, fear), a deeper cause of the sense-presence effect is to be found in the brain: (1) An extension of the normal sensed presence we experience of real people around us; (2) A conflict between the low-road of emotions and the high-road of reason; (3) A conflict within the body schema, or our physical sense of self, in which the brain is tricked into thinking that there is another you; (4) A conflict within the mind schema, or our psychological sense of self, in which the mind is tricked into thinking that there is another mind.



6 NATURAL-BORN DUALISTS

Yale University psychologist Paul Bloom says that we are natural-born dualists. Children and adults alike, for example, speak of "my body," as if "my" and "body" are two different entities. In an experiment Bloom told young children a story about a mouse that gets munched by an alligator. The children agree that the mouse's body is dead—it does not need to go to the bathroom, it can't hear, and its brain no longer works. However, they insist that the mouse is still hungry, concerned about the alligator, and wants to go home. "This is the foundation for the more articulated view of the afterlife you usually find in older children and adults," Bloom says. "Once children learn that the brain is involved in thinking, they don't take it as showing that the brain is the source of mental life; they don't become materialists. Rather, they interpret 'thinking' in a narrow sense, and conclude that the brain is a cognitive prosthesis, something added to the soul to enhance its computing power." The reason dualism is intuitive is that the brain does not perceive itself, and so imputes mental activity to a separate source. Hallucinations of preternatural beings such as ghosts, gods, angels, and aliens are perceived as real entities, Out-of-Body and Near-Death Experiences are processed as external events, and the pattern of information that is our memories, personality, and self is sensed as a soul.

7 DOPAMINE

Exploring the neurochemistry of superstition and magical thinking, psychologists Peter Brugger and Christine Mohr found that people with high levels of dopamine are more likely to find significance in coincidences and pick out meaning and patterns where there are none. In one study, they gave 40 subjects L-Dopa—the drug used for Parkinson's Disease patients that increases the levels of dopamine in the brain—and found that the boost of dopamine caused people to identify scrambled faces and real and jumbled words as normal. Why? Dopamine increases the rate of neural firing in association with pattern recognition, which means that synaptic connections between neurons are likely to increase in response to a perceived pattern. Increasing dopamine increases pattern detection, and other scientists have found that dopamine not only enhances learning but in higher doses can also trigger symptoms of psychosis such as hallucinations.

8 RIGHT BRAIN v. LEFT BRAIN

Carl Sagan wrote: "There is no doubt that right-hemisphere intuitive thinking may perceive patterns and connections too difficult for the left hemisphere; but it may also detect patterns where none exist. Skeptical and critical thinking is not a hallmark of the right hemisphere." In split-brain experiments Peter Brugger presented subjects with strings of letters forming either a word or nonsense to either the left visual field or the right visual field, instructing the subjects to respond when they recognized a word. The subjects also rated their belief in ESP on a 6-point scale. *Results*: skeptics had greater left hemispheric dominance compared to believers, and believers had superior right hemispheric performances compared to skeptics.

9 SLEEP ANOMALIES & LUCID DREAMS

Alien abduction experiences typically occur during sleep and strongly resemble *hypnagogic* (just after falling asleep) and *hypnopompic* (just before waking up) hallucinations. Other dream states such as *Lucid dreaming* and *sleep paralysis* also contain components that parallel the abduction experience. Hypnagogic and hypnopompic hallucinations occur in the fuzzy borderlands between wakefulness and sleep, when our conscious brain slips into unconsciousness as we fall asleep, or transitions into wakefulness from sleep. Reality and fantasy blur. Multiple sensory modalities may be involved, including seeing and hearing things that are not actually there such as representational images, geometric patterns, speckles, or lines. Hallucinatory images may be in black-and-white or in color, still or moving, flat or 3-D, and sometimes even include the spiraling tunnels reported by people who have Out-of-Body and Near-Death experiences.

Hallucinations can also be auditory such as hearing your name called, or the sound of a doorbell or knocking, and even fragments of speech from others imagined to be in the room. Lucid dream images are even more vivid because the sleeping person is aware that he or she is asleep and dreaming and can participate in and alter the dream itself. Sleep paralysis is a type of lucid dream in which the dreamer, aware of the dream, also senses paralysis, pressure on chest, presence of a being in the room, floating, flying, falling, or leaving one's body, with an emotional component that includes an element of terror, but sometimes also excitement, exhilaration, rapture, or ecstasy.

10 PATTERNICITY

Imagine that you are a hominid on the plains of Africa three million years ago. You hear a rustle in the grass. Is it just the wind or is it a dangerous predator? If you assume that the rustle in the grass is a dangerous predator but it turns out that it is just the wind, you have made a *Type I Error* in cognition, also known as a *false positive*, or believing something is real when it is not. That is, you have found a nonexistent pattern. No harm. You move away from the rustling sound, become more alert and cautious, and find another path to your destination. But if you assume that the rustle in the grass is just the wind but it turns out that it is a dangerous predator, you have made a *Type II Error* in cognition, also known as a *false negative*, or not believing something is real when it is, in this case a dangerous predator. You're lunch! You are no longer a member of the hominid gene pool.

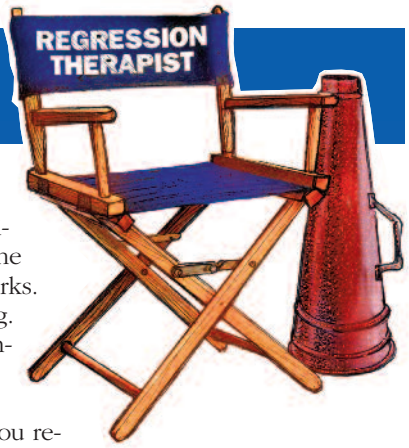
Our brains are belief engines, evolved pattern-recognition machines that connect the dots and create meaning out of the patterns that we think we see in nature. Sometimes (**A**) really is connected to (**B**), sometimes it is not. The baseball player who doesn't shave (**A**) and hits a home run (**B**) forms a false association between (**A**) and (**B**), but it is a relatively harmless one. When the association is real, however, we have learned something valuable about the environment from which we can make predictions that aid in survival and reproduction. We are the descendants of those who were most successful at finding patterns. This process is called *patternicity*, or *the tendency to find meaningful patterns in both meaningful and meaningless noise*. The problem is that assessing the difference between a Type I and Type II error is highly problematic—especially in the split-second timing that often determines the difference between life and death in our ancestral environments—so the default position is to assume that all patterns are real; that is, assume that all rustles in the grass are dangerous predators and not the wind. This is the basis of all superstition and magical thinking.

11 AGENTICITY, OR SYMPATHETIC MAGIC

Let us return to our hominid on the plains of Africa who hears a rustle in the grass, and the crucial matter of whether the sound represents a dangerous predator or just the wind: "wind" represents an *inanimate force* whereas "dangerous predator" indicates an *intentional agent*. Thus we tend to practice *agenticity*: *the tendency to infuse patterns with meaning, intention, and agency*. That is, we often impart the patterns we find with agency and intention, and believe that these intentional agents control the world, sometimes invisibly from the top down. Souls, spirits, ghosts, gods, demons, angels, aliens, and all manner of invisible agents with power and intention are believed to haunt our world and control our lives.

Examples of agenticity abound. Subjects watching reflective dots move about in a darkened room, especially if the dots take on the shape of two legs and two arms, infer that they represent a person or intentional agent. Children believe that the sun can think and follows them around, and when asked to draw a picture of the sun they often add a smiley face to give agency to it. Genital-shaped foods such as bananas and oysters are often believed to enhance sexual potency. A third of transplant patients believe that the donor's personality or essence is transplanted with the organ. Psychologist Bruce Hood found that most people say that they would never wear the sweater of a murderer, showing great disgust at the very thought, as if some of the murderer's evil rubbed off in the material of the sweater, but that most people say that they *would* wear the cardigan sweater of the childrens' television host Mr. Rogers, believing that wearing the sweater would make them a better person. We see agency everywhere we look, and sometimes those agents are ghosts and gods, angels and demons.

12 HYPNOSIS AND MEMORY



Many alien abduction experiences are "remembered" years or decades after the fact through a technique called hypnotic regression, in which a subject is hypnotized and asked to imagine regressing back in time to retrieve a memory from the past, and then play it back on the imaginary screen of the mind, as if there's a diminutive homunculus sitting inside a little theater in the head and reporting to the brain's director what he is seeing. This is not at all how memory works. The metaphor of memory as a videotape playback system is so far off that it is not even wrong. There is no recording device in the brain. Memories are formed as part of the association learning system of making connections between things and events in the environment, and repetitive associations between them generates new connections between neurons, which are then strengthened through additional repetition or weakened through disuse. Use it or lose it. Do you remember your 10th birthday, or do you remember your mother's comments about it as you looked at party photos when you were 20? Have you added incidents from other parties you attended or even party scenes from TV? It is likely all of the above, and much more. So, when an alien contactee is "recovering" a memory of an abduction experience, what is actually being recovered? Analysis of hypnotic regression tapes used by abduction "therapists" who employ hypnosis shows that they ask leading questions and construct imaginary scenarios through which their subjects may concoct an entirely artificial event of something that never happened.

13 NEAR-DEATH EXPERIENCES (NDEs)

Since the advent of jet planes capable of powerful G-force accelerations that can cause pilots to lose consciousness during aerial maneuvers, the U.S. Air Force and Navy have undertaken a number of studies on how to fight G-Force Induced Loss of Consciousness or G-LOC. Dr. James Whinnery studied pilots using the centrifuge at the Naval Warfare Center in Warminster, PN, where he discovered a remarkable phenomenon experienced by the majority of pilots—what he called "dreamlets" consisting of brief episodes of tunnel vision (sometimes with a bright light at the end), as well as feelings of floating or paralysis, and, after they regained consciousness, a sense of euphoria or peace and serenity.

These are the same characteristics of a Near-Death Experience (NDE). Whinnery induced NDEs over a thousand times under the controlled conditions of the centrifuge. Under high G-Force, the blood drains out of the head and pools in the torso, sending pilots first into a gray-out phase followed by a black-out state, all within a matter of 15-30 seconds. The NDEs occurred during black-outs suggesting the cause: *apoxia*, or oxygen deprivation to the cortex. When G-LOC is induced in a gradual fashion by accelerating the centrifuge in a systematic manner, the subjects first experienced tunnel vision, then blindness, then blackout, which is likely caused by the loss of oxygen first to the retina then to the visual cortex (producing tunnel vision as the neurons shut down from the outside to the inside), leading to total blackout when the majority of the cortex powers down.

NDEs can also be generated by electrical stimulation of the *right angular gyrus* in the temporal lobe. A 43-year old patient suffering from severe epileptic seizures reported feelings of "sinking into the bed" and "falling from a height" after mild electrical stimulation of this area. More intense stimulation led her to "see [her]self lying in bed, from above…" And even more induced "a feeling of lightness" and a sense of "floating about two meters above the bed." The scientists discovered that they could even control the height above the bed the patient reported that she floated by the amount of electricity delivered.