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Visions and Hallucinations

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> **Religious wars and witch crazes throughout history would have been far fewer in number had hallucinations been known as natural phenomena and had men "possessed by the devil" been considered ill.**
>
> **Robert L. Thorndike**

Introduction.

When did you last say to someone, "I saw it with my own eyes"? In so doing, you were inviting the inference that *it* existed "out there"--somewhere "in the real world." If, instead, you had said, "I saw it with my own brain," your statement, although closer to the truth, would have lost much of its intended force. That is because it would no longer automatically command the assumption that you had perceived a tangible object "out there." Someone might even have had the audacity to suggest, "Couldn't it have been a figment of your imagination?"

Although the statement "I saw it with my own brain" may have an odd ring, it serves to remind us that the cerebral mechanisms of perception--where sensory events are *really* processed and experienced--are at some remove from the scene of the action. Perceptions are transformations of external stimuli encoded in networks of active brain cells. Perceiving is sometimes referred to as "sensory reasoning," a way of acknowledging that the final product owes more to cognitive interpretation than we may think. For that reason, it is not always possible to distinguish externally-driven percepts from functionally equivalent states of the brain such as dreams, sensory memories, and fantasies. How we ordinarily distinguish reality from mental imagery or vivid

daydreams and why this ability should sometimes break down are central to an understanding of hallucinations (Bentall 1990).

The boundary between perception and imagination is more easily crossed than most of us realize. In this insufficiently known fact lie many prosaic explanations for allegedly paranormal phenomena. A century of psychological research has demonstrated that factors as diverse as attention, arousal, belief, desire, context, suggestion, expectancy, fatigue, boredom, stress, and even personality, influence what we perceive. In light of this and the many payoffs for engaging in "wishful thinking," it should not be surprising that "Believing is seeing" is, in many instances, just as true as the old adage "Seeing is believing."

What are hallucinations?

Hallucinations are defined by the *Diagnostic and Statistical Manual for the Mental Disorders (DSM-III-R)* of the American Psychiatric Association as: "a sensory perception without external stimulation of the relevant sensory organ." To the hallucinator, these phantasms seem objectively real. In some instances, however, self-generated imagery could be mistaken for genuine perceptions except for a lingering awareness that the experience does not correspond to the external world. These are known as "pseudo-hallucinations." Most experts reserve the term "hallucination" for those mental pageants that are so rich and compelling that the percipient unquestioningly accepts them as real. Full-blown hallucinations integrate imagery from all sense modalities, feel unwilled by the hallucinator, and have the emotional impact that makes them utterly convincing.

The term "vision" encompasses essentially what is meant by "hallucination" but has the further connotation of mystical significance. "Visions" (or "voices") supposedly emanate from enlightened beings and are directed specifically to the recipient for his or her edification--i.e., "a revelation unto the chosen." History records that many revered figures such as Joan of Arc, Martin Luther, Saint Paul, Mohammed, and Mozart felt they had been guided in this way, but it also warns us that Hitler, Attila the Hun, Idi Amin, and Charles Manson felt similarly chosen. That all *experienced* their voices and visions as "coming from beyond" is uncontestable. It is not equally apparent, however, that these events transpired outside the theatre of their own minds.

Since ancient times, "visions" of ghosts, demons, angels, and deities have fueled supernatural beliefs and spawned new religions. A close relative is the so-called "hallucination of presence" where one only senses the nearness of unseen spirits (Reed 1988, 44). Likewise, so-called "transcendent," "near-death," and "out-of-body" experiences have hinted at an after-life, higher planes of existence, cosmic consciousness, and other mystical states. Occasionally, perception-like insertions can blend with otherwise accurate impressions of the environment, begetting "sightings" of fairies and leprechauns, not to mention assorted monsters of land and sea. And lately, a high-tech variant has emerged: alien spacecraft piloted by supposedly rapacious crews.

It should be emphasized that although pathologies such as psychoses, brain damage, infections, and epilepsy can produce vivid hallucinations, not all hallucinations are pathological. They also occur in normal, healthy individuals--in fact, more often than is widely believed. The apparent normality of many who report these anomalous experiences leads some to conclude that they must have been objectively real, but it should be remembered that sane, honest people are frequently convinced they have seen and heard things that investigators cannot confirm. Granted, they have had an *experience* and are honestly reporting how real it *felt*. Fortunately, our emerging understanding of the brain's perceptual and cognitive machinery can suggest naturalistic--and not necessarily pathological--explanations for these dramatic interludes.

Hallucinations are experienced whenever something internal (as opposed to environmental) triggers a pattern of brain activity equivalent to that normally generated when sense organs respond to a publicly observable event. Thus, if the brain's subjective awareness mechanisms were to be flooded by neural discharges from memory banks in the presence of certain other conditions outlined below, the experience could feel just as real as if it had been engendered by actual events "out there."

Reed (1988) describes some phenomenological differences that normally lessen the probability of mistaking internally-generated imagery for authentic perceptions. Although percepts and imagery share some experiential attributes (and cerebral hardware), the former derive their objective, "out there" quality from a number of tell-tale cues. E.g., perceptions of physically-present

stimuli are typically brighter, more detailed, and more vividly colored. This imparts a certain clarity that the more muted and diffuse subjective images tend to lack. Perceptions also have a constancy and continuity that is less characteristic of imagery. Perceptions tend to unfold more passively than images. I.e., they feel as though they are happening *to* you, not created *by* you. The feeling that a percept is objectively real stems in part from the absence of any sense of effort to "conjure it up." Mental imagery, on the other hand, usually has a more active, capricious feel; its contents seem more responsive to our will. Thus when a particularly vivid image spontaneously "pops into mind," its lucidity and unbidden quality help make it seem more perceptual than imagistic--the genesis of many a hallucination.

Surprisingly, though, if these cues that help distinguish images from percepts should become blurred and someone believes she has seen or heard something others dismiss as hallucinatory, this is frequently rejected with the counter-claim that the experience seemed to be of *greater* than ordinary "realness." That is, it couldn't have been illusory because it actually felt "more real than real." This hyper-real quality of many hallucinations demands an explanation (see below, and Beyerstein 1988). It prompted Blackmore (1993, 161) to step back and raise the more basic question of why anything ever feels real.

Reality: Made to order.

Cognitive psychologists and neurophysiologists concur that the "job" of consciousness is to construct a mental model of reality from the various inputs at its disposal. By this process of sensory reasoning, the brain assembles an internal representation of the environment. It takes fragmentary information from the senses and "fills in" the gaps to produce our global experience of existing in the world around us. As part of the exercise, it also constructs a mental model of one's own body and the self that seems to inhabit it.

If the brain mechanisms that assemble those models should be disrupted, this carefully crafted sense of a self dwelling within a physical body, distinct from the rest of the universe, dissolves. While this could be highly disturbing if it happened spontaneously (which it sometimes does), this feeling of "one-ness with the universe" is the ultimate goal for mystics. Without understanding why their rituals work, many esoteric

movements have independently stumbled upon similar physical and psychological manipulations that affect the brain to produce such experiences (Sargant 1957). Known to acolytes as "transcendence," "cosmic consciousness," or "nirvana," psychologists call them "depersonalization" and "de-realization" (Neher 1980; Beyerstein 1988; Reed 1988; Zusne and Jones 1991).

Why do we sometimes confuse fantasy with reality?

I have emphasized so far that our "ordinary" perception of the world is a complex abstraction--a constructed model rather than a one-to-one registration such as a video recorder might capture. In creating our reality model raw sensation is leavened with the naming, associative, and inferential operations of cognition and the emphatic qualities of emotion. Our internal representation of reality is the end product of pre-conscious operations so intertwined that it is uncertain where sensation leaves off and cognitive interpretation begins. Information is filtered and embellished from memory as it passes through the sensory-cognitive network. Primitive sense data are combined with what we already know about the world and what we wish it to be. If this is so, might the brain not assemble, on occasion, a model of reality entirely from internal resources--i.e., a hallucination?

Research suggests that the brain can work on several models simultaneously and Blackmore (1993) argues that in deciding what is "out there" it confers the accolade of "reality" on that mental representation which is currently the most stable, complex, and coherent. When attention is outwardly directed, that will usually be the model that is most richly supplied with external sense data. Selection among models is necessary because the brain's representational systems not only produce a scenario to guide behavior at the moment, but also provide the wherewithal for our flights of fancy. This kind of imagistic thinking permits us to experiment with possible courses of action "in our mind's eye"--to let our ideas die in our stead, as it were. In daydreams we can call up images of objects, activities, and places that are not present. We can place ourselves in the scene, in "bird's-eye view," and watch events unfold. If need be, we can even conjure up images of things like unicorns that never could have been "out there." Given the ease with which we construct detailed mental tableaux that never happened, it should

hardly seem mysterious that the brain could occasionally mistake one of them for reality. After all, our nightly dreams often seem terrifyingly real.

Brain mechanisms of perception, imagery, and hallucination.

The 19th-century British psychologist Sir Francis Galton emphasized the continuity of all forms of visualization, whether stimulus-driven or memory-driven. Neurologically speaking, sensation, mental imagery, dreams, daydreams, and hallucinations are cut from the same cloth. Oakley (1985) described how the brain employs much the same apparatus in perceiving and fantasizing. He suggested how neural mechanisms might have evolved to represent the world and our sense of self.

> In less demanding conditions, when a physical response is not called for,... the priority processing area [of the brain] remains available and can accept lower priority items which are quite divorced from external events. The extreme ... is [a] mental reverie or daydream, though there are normally sufficient numbers of external events earmarked for special attention and possible action to ensure that externally and internally derived events are mixed in self-awareness." (Oakley 1985, 141)

Siegel (1977) has emphasized that there is competition between external and internal inputs for access to this central awareness system. Much research supports his notion that impeding access of one set of inputs to consciousness leaves the stage open for additional impact from its rivals. Marks (1983) has reviewed the many ingenious behavioral studies supporting the conclusion that the same cerebral mechanisms serve perception and imagery. Schatzman (1980) reinforced the behavioral evidence with electroencephalographic data from a woman who can produce extremely vivid hallucinations at will. By comparing visual evoked potentials recorded while she was and was not hallucinating, Schatzman was able to infer that parts of her brain that normally process external visual information were usurped, during her hallucinations, by processing of visual imagery from memory. That auditory hallucinations are correlated with activity in the brain areas that mediate perceptions of real sounds has also been demonstrated with EEG recordings (Stevens and Livermore 1982, in Bentall 1990).

Jacobs (1976) described how the brain's arousal and attentional systems could allow visual images from memory to predominate

during dreams but normally not during waking. He showed how the neurochemistry of this gating mechanism is affected by hallucinogenic drugs, permitting waking consciousness to be swamped by highly emotional dream-like imagery. By extension, a similar opening of the floodgates of sensory memory could occur during non-drugged wakefulness as a result of several spontaneous or behaviorally-induced changes in brain biochemistry (Mandell 1980).

The neural systems described by Oakley, Jacobs, and Mandell include parts of the cerebral cortex and the more primitive, "limbic system." As I have discussed elsewhere (Beyerstein 1988), subcortical limbic structures serve memory, imagery, motivation, emotion, and the spatio-temporal mapping of self and environment. They are responsible for the sense of familiarity and personal meaningfulness that makes some mental representations feel more real than others. If those mechanisms, which both assemble the reality model and weigh its significance, were to erupt spontaneously, they could concoct a convincing mental panorama and imbue it with a feeling of special realness and importance. Electrical stimulation of these parts of the brain in awake neurosurgical patients elicits other-worldly visions suffused with profound meaningfulness and cosmic importance. It can also precipitate feelings of deja vu, ecstasy or foreboding, as well as estrangement from the body where patients are convinced they are looking down at their bodies from above. It should be noted in passing that the fact that memories and dreams often occur in this bird's-eye perspective is one of the reasons for concluding that out-of-body and near-death experiences are really complex, memory-driven hallucinations.

Blackmore (1993) notes that the mental model dubbed "reality" is that which is most stable and complex. The candidate with greatest clarity and coherence is ordinarily the model richest in sense data. Under severe psychological stress, physiological trauma, or attentional manipulations such as meditation, sensory deprivation, or hypnosis, the brain's representational apparatus may lose access to the sense data that are ordinarily its most predictive and useful inputs. So deprived, it begins to search for the next best alternative, usually images stored in memory banks. Thus a model from memory becomes "real" for the time being. If, as during nightly dreams, the brain's reality-testing processes are also disengaged, peculiarities of the temporary model (i.e., hallucination) are less likely to cause its immediate rejection.

The world "out there."

Why would a memory-based model of reality suddenly seem to leap out into objective space? Zusne and Jones (1992, 113) contend that this is because there is "a mechanism of projection inherent in all sentient organisms." Projection occurs unconsciously in constructing our subjective representations of the external world. After all, the brain never comes into direct contact with objects around us, only neurally-encoded transformations of the light, sounds, smells, etc., they produce. Yet, we do not feel that the objects represented by this neural activity are inside our heads. We experience them as outside of ourselves because in creating a mental model of three-dimensional space, the brain populates it with representations of objects at their inferred locations.

An example from another sense modality may clarify how the brain projects illusory stimuli out to the external world. Recall the last time you banged that grossly mis-named part of your anatomy, the "funny bone." In addition to the understandable pain in your elbow, you also felt a stabbing sensation in your finger tips. Why should your fingers have hurt when it was your elbow that you bashed? The reason is that, on their way up to the spinal cord, the nerves that conduct sensory information from your fingers cross over the bones of your elbow. Striking your elbow imparts mechanical energy which excites these nerve tracts at the point of impact, part way up the route from skin receptors to brain. Despite having begun higher than usual in the pathway, the signal thenceforth propagates normally until it reaches the brain site that represents the fingers. Because this area has no way of knowing the message began in midstream, it creates the illusion of a painful stimulus applied to the finger tips (whence pain information on that incoming line would normally have arisen). In other words, the brain projected a hallucinatory pain out to the body surface.

What if an anomalous message of this sort begins even higher in a sensory system, such as when someone is struck on the back of the head and "sees stars"? There was no corresponding light in the environment, no retinal image, and no activity in the neurons (nerve cells) of the sensory pathways feeding into the visual cortex. Rather, mechanical energy from the blow activated cells in the visual cortex directly and the victim perceived an

illusory flash "out there."

The nature of a sensory experience is determined by which brain area is activated, not the kind of energy that began the process. When pressure rather than light initiated neural activity in the visual cortex, it was still perceived as a light. Each type of peripheral receptor has one kind of energy to which it responds preferentially but most other kinds of energy will also trigger a response if they are sufficiently intense. The same is true for neurons higher in the sensory pathways--they normally respond to chemical messengers from other neurons, but physical deformations, chemical imbalances, electrical fields, drugs, etc., can also set them off. Because the sensory quality corresponds to which neurons are active, electrically exciting cells in the auditory system, for instance, will always be perceived as sound.

This knowledge has been put to use in prostheses for people with damaged peripheral sense organs but whose sensory cortex remains intact. Using a computerized signal from a TV camera, contours in the world are turned into patterned electrical pulses delivered by grids implanted on the surface of the visual cortex (Zimmer 1993). The result is a crude experience of objects in the environment. Similarly, electrical signals from microphones have been fed into intact auditory tracts in the brains of deaf people. It is interesting that wearers of prosthetic implants perceive the sights and sounds produced thereby as coming from the external world. If a computer malfunction in one of these brain stimulators were to substitute data from its memory banks in place of the processed signal from the camera or microphone, would the person with the prosthesis know the difference?

Perhaps the best indication that our sense of a self inhabiting a body in physical space is a brain-constructed model comes from so-called "phantom limbs." Phantoms are amputated body parts that continue to be experienced as if they were present and functioning. Phantom legs can seem so real that amputees will attempt to stand on them. Phantoms can itch although there is nothing there to scratch. Worse yet, severed limbs sometimes feel grotesquely contorted. Or they may feel as though they are incessantly moving, producing all the same subjective feelings of exhaustion as real overexertion. Most disturbing of all, phantoms can be so painful that amputees have been known to commit suicide to escape the unrelenting agony. To account for the "incredible reality" of phantoms, Melzack (1989) invoked what

he calls the "neuromatrix"--the brain network which he suggests represents the body and the self. Phantoms seem real because they are "produced by the same brain processes that underlie experience of the body when it is intact." The neuromatrix remains whole even when one of the appendages it represents is severed. Stray neural signals in the areas responsible for the formerly present body part can perpetuate its hallucinatory existence, sometimes with horrific intensity.

A related phenomenon is reported in some people who are blind in a sector of their visual field due to damage to a part of their visual system. In the neurological oddity known as Charles Bonnet Syndrome, visual memory "fills in" those sectors where sensitivity has been lost. Alongside normal perceptions in the intact part of the field, these patients see an animated sideshow of objects, people, and animals, completely unrelated to whatever they are correctly seeing in the undamaged areas. Bizarre as this may sound, it may seem less odd if we remind ourselves that we all have a blind spot in our visual fields that our brains fill in. In the area of the retina where the branches of the optic nerve collect to exit the eyeball all visual receptors are pushed aside. Thus there can be no registration of stimuli from the corresponding area in space. Yet none of us notices the gap --the brain fills it in by extrapolating the scene on all sides of the blind spot. Thus we might say that a part of every scene we look at is a hallucination.

Predisposing conditions.

The probability of hallucinating rises with any of several possible functional realignments within the brain's awareness system (Horowitz 1975, 164). One predisposing factor is anything that prompts a shift from lexical (i.e., word-based) thinking to imagistic or pictorial thinking. Another is anything that biases the brain's representational system toward its internal sources (memory images) at the expense of external information via the sense organs. This could arise because there is a paucity of external stimulation or because the salience of internal contributions is amplified by strong motivation or a temporary weakening of the mechanisms (discussed earlier) that suppress vivid imagery during waking (except when we engage in visual thinking or day-dreaming).

Stress-induced arousal from sources such as life-threatening

accidents or natural disasters, sustained military operations, terrorist attacks, or recent bereavement, has also been shown to trigger hallucinations (Bentall 1990). Likewise, the roles of suggestion and classical (i.e., "Pavlovian") conditioning have been investigated. In the latter, conditioned stimuli have been found to evoke hallucinatory images as conditioned responses, much like Pavlov's dogs came to salivate to a previously neutral bell after it had been associated with food.

While fears and conflicts often slip into consciousness via the imagistic mode, hallucinations are also sought as a source of inspiration, a rite of passage, or verification of special status. Prolonged meditation, drugs, repetition to the point of physical and emotional exhaustion, various kinds of self-denial, and even self-mutilation are all routes that seekers have pursued. Suggestion and strong desire, as in those who fervently seek reassurance that deceased loved ones survive in another realm, are also common instigators.

Just as psychedelic drugs can trigger hallucinations, so can spontaneous eruptions in the brain. Epileptic attacks, particularly of the type known as complex partial seizures or temporal lobe epilepsy, can produce prolonged dreamy states with extremely life-like hallucinations, intense meaningfulness, and feelings losing one's autonomy to unseen entities (Beyerstein, 1988). Similarly, migraine attacks are capable of producing vivid perceptual effects that have been interpreted as glimpses of other worlds.

Other conditions known to be conducive to hallucinations are astonishingly diverse (Siegel 1992). They include sensory deprivation or sensory overload (especially with intense repetitive stimuli), extended fasting, dehydration, social isolation, or sexual abstinence. To various toxicities and diseases of the brain can be added oxygen deprivation, hyperventilation, hypoglycemia, and overdoses of common non-prescription drugs, as well as high fever, delirium, and extreme pain. Aberrations of the brain's arousal system are also common precipitants: e.g., extended sleep loss, fatigue, hypnagogic and hypnopompic states (hallucinatory reveries occurring at the boundaries between sleep and waking), and narcolepsy and other diseases of the sleep-waking system. Many of the foregoing were present during the long solo flight of Charles Lindbergh, the solitary circumnavigations of Joshua Slocum and Francis Chichester, and the polar expeditions of Admiral Richard Byrd--all of whom reported vivid hallucinations during their epic

journeys.

Overwhelming the reality-checking processes.

Full-blown hallucinations are facilitated by the presence of fatigue and monotony on the one hand, or strong emotions, needs, and arousal, on the other. All can hinder the cognitive strategies we normally rely upon to check the veracity of our perceptions. E.g., we can compare between sense modalities: "I see it, but can I also reach out and grasp it?" Similarly, we can check against memory: "Does this seem familiar?" Or with cognitive appraisal: "Does this make sense?" And, as a last ditch, we can enlist the aid of our peers: "Did you see *that*?"

Some people experience more intense imagery to begin with and may also be poorer than others at judging the differences between real and imagined events. Hence they would be more prone to hallucinate. Situational variables can make the task of reality discrimination more difficult for everyone under certain conditions. Bentall (1990) has reviewed the research on cognitive misattributions by which "hallucinators mistake their own internal, mental, or private events for external, publicly observable events."

> **If the misattributed event is inner speech or verbal thought, then the hallucinations will be in the auditory modality; if it is visual imagery that is misattributed, then the hallucinations will be visual (Bentall 1990, 88).**

Fantasy-prone personalities.

For most people, vivid hallucinations are rare (if we exclude dreaming), but for a few otherwise-normal people they are an everyday occurrence. In what began as an attempt to characterize the "best-of-the-best" of the hypnotizable population, Wilson and Barber (1983) first eliminated anyone with detectable psychopathology. Then, by requiring ever higher standards of hypnotic virtuosity, they winnowed down their group. In the process, they serendipitously uncovered a number of people (up to 4% of the normal population, as it turned out) who fantasize vividly during a large part of their waking lives. Although they hallucinate much of the time, it is sufficiently controllable that it tends not to interfere with their safety, jobs, or family

lives.

Wilson and Barber termed these people "Fantasy-Prone Personalities" (FPPs). FPPs can hallucinate with eyes open or closed and can conjure up whole scenes or add features to real backgrounds. While fantasizing, FPPs experience the reduction in awareness of time, place, and personal identity characteristic of deep hypnosis, all without any formal induction procedure. All sense modalities are affected. They "see," "hear," "smell," and "touch" (for all intents and purposes, they *live in)* the worlds they fantasize. Their experiences seem so real that FPPs can reach orgasm without physical stimulation, just by imagining a sexual encounter.

FPPs remained un-noticed and unstudied for so long because the dominant work ethic denigrates their unusual abilities. Such "unearned" pleasures and "unproductive" activities tend to be discouraged, so FPPs learn early on to conceal their heavy involvement in fantasy for fear of being thought weird or escapist. Because they frequently confuse fantasy and reality, this disposes them toward many paranormal beliefs. Thus FPPs tend to be well represented among mystics, sensitives, mediums, and channelers who believe they have privileged access to alternate realities.

Contents of hallucinations.

Although, hallucinations are noteworthy for their diversity, research has uncovered some interesting commonalities as well (Siegel 1992). In the 1920's, Heinrich Kluver began studying the contents of people's experiences while on the hallucinogen mescaline (Farthing 1992). Kluver classified the elementary forms in the early phases into categories he called (a) lattices and gratings, (b) cobwebs, (c) spirals and (d) tunnels, funnels, or alleyways. These appeared with eyes closed, but with eyes open they seemed to hang in space at about arm's length. Size, coloring and brilliance varied and people reported little success in controlling them voluntarily. Kluver recognized that the same shape constants were typical of the drowsy transitions between sleep and waking, and of fever, delirium, migraine, epilepsy, and some psychoses. Similar form constants can also be elicited by trains of pulsating lights, intense crystal ball gazing, prolonged sensory deprivation, electrical stimulation of the visual cortex, and virtually all other hallucinogenic drugs. The

tunnel sensation is also a major feature of near-death experiences.

The heirs to Kluver's research program were Ronald Siegel (1977, 1992) and his colleagues who agreed that the ubiquity of these form constants suggests they represent the activation, by various routes, of the same underlying physiological mechanisms. These sensory fragments are the building blocks from which the brain's sensory systems assemble our perceptions of the world, mental images, dreams, *and hallucinations*.

Of course, Kluver was aware that hallucinations are usually more complex and life-like than the form constants which he realized were only the prologue to full-blown visions. The subsequent stage typically involves images of faces, animals, and other natural objects interlaced with the form constants. In Kluver's final stage, these fragmented images coalesce into meaningful dream-like panoramas.

Psychopharmacologists have emphasized that the contents of drug-induced visions are especially vulnerable to factors they call "set and setting." The former refers to the motivations, knowledge, expectations, mood, and personality of the user. The latter are the physical and psychological conditions under which he or she takes the drug. These non-drug ingredients are so important in shaping the "psychedelic" experience that the late Sydney Cohen once remarked that, as far as LSD was concerned, people, by and large, get the trips they deserve! Set and setting are important determinants of the contents of all hallucinations. Is it any accident that ghosts are more frequently seen by believers than skeptics and seem to prefer musty, dark Victorian houses to well-lit glass and steel sky scrapers?

Horowitz (1975) has been particularly interested in the dynamics of how hallucinations build in the simple-to-complex fashion described by Kluver and Siegel. In his "perceptual nidus theory," Horowitz notes that the mind strives at all times to make sense of input, no matter how sparse, disjointed, or bizarre. When trauma, drugs, etc., jar loose the prevailing reality model and release the simple form constants (the nidus), consciousness immediately begins to collect them into more naturalistic images and name them, much as we do when we see recognizable objects in smoke, tea leaves, or clouds. This further engages associative and interpretive faculties, bringing

the full imagistic resources of memory into play. Horowitz's descriptions of hallucination-building can be seen as a special case of the everyday processes of assembling a reality model from incomplete sense data, discussed earlier. People who impose on a few flashes of light in the night sky visions of space vehicles, complete with portholes and pilots, and those who turn a wind-rustled curtain into a menacing ghost could likewise be victims of set and setting. Similarly, it has been pointed out how these constructive, imagistic process can be influenced by some overly suggestive therapists to create false, but detailed and believable, perceptual "memories" of ritual satanic abuse, childhood incest, and alien abductions (Loftus 1994).

Given the dynamics of the generative process, the possible range of hallucinatory contents would seem practically infinite. As Read (1988, 48) notes, they potentially include anything previously experienced plus reconstructions and syntheses of fragments from memory. "Visions" and "voices" can be entirely self-generated or can include veridical representations of the environment which also incorporate bits of memories. As such, they often reflect the hallucinator's needs, problems, and preoccupations. The novelist Ambrose Bierce recognized this when he defined a ghost as "the outward and visible sign of an inward fear." By the same token, the resurgence of angel sightings in recent years might be termed an outward manifestation of an inward *hope*.

Conclusion

In this essay I have argued that hallucinations are best explained as unusually vivid images experienced when normal reality checking processes are temporarily impaired. Since photography and video recorders have become commonplace, people have begun to assume that our senses record everything in a similar passive, one-to-one fashion. In fact, perception is much more constructive and reconstructive than this. Its job is not only to record but also to infer, predict, and make sense of the world. In so doing, this system that works passably well most of the time occasionally begins to manufacture and make sense of things that aren't really there. Anything that temporarily impedes the representational system's ability to model the world based on external sense data will send it scurrying about for an acceptable replacement, usually perceptual memories. This will seem real for the time being, but if sensory data should reassert

themselves, this too will pass.

Unexpectedly perhaps for a contributor to this volume, I must end by agreeing with New Age proponents on one point. When New Agers assert that "You create your own reality," they are, as I have tried to show, partially correct. Unfortunately, they proceed to stretch this insight to absurd lengths. It is true that each of us constructs our own model of reality which, though fallible, is the best we have to go on, unaided, at any given time. Beyond that, some New Agers make the nonsensical leap to assert that whatever this subjective representation leads us to *believe* is true, will then be magically imprinted upon the external world. People have been known to step off balconies into alluring hallucinations. These visions were real enough to entice their victims, unfortunately not real enough to sustain them.

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