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The Night-mare in the Sleep Lab

> "Besides waking life or sleeping life there is a third state, even more important for intercourse with the spiritual world. . . . I mean the state connected with the act of waking and the act of going to sleep, which last only briefly, for we immediately pass on into other conditions."
>
> –Rudolf Steiner (1999, 152)

As a consequence of the laboratory sleep research of the mid-twentieth century, the night-mare was finally liberated from its exclusive association with psychiatric illness (Cheyne, Rueffer, and Newby-Clark 1999; Kryger, Roth, and Dement 2000). The first step in the de-pathologizing of the night-mare was the recognition of the ubiquity of sleep paralysis in the general population.[1] Most estimates of the prevalence of sleep paralysis are in the range of approximately 25 to 30 percent, but individual study findings vary considerably, with reports of 6 to 40 percent of healthy adults having experienced at least one episode of sleep paralysis (Arikawa et al. 1999; Awadalla et al. 2004; Buzzi and Cirignotta 2000; Cheyne, Newby-Clark, and Rueffer 1999; Cheyne, Rueffer, and Newby-Clark 1999; Fukuda et al. 1998; Kotorii et al. 2001; Ohayon et al. 1999; Spanos et al. 1995; Wing et al. 1999). It is not clear why there is such a wide range in reported rates, but some differences are likely due to the fact that many researchers make use of small, nonrandomized samples, as well as the fact that the wording of questions used to assess and categorize sleep paralysis is inconsistent across studies (Fukuda 1993; Ohayon et al. 1999). Perhaps most significantly, though, cultural context clearly contributes to the differences in reported prevalence. If a cultural category pertaining to sleep paralysis exists, it is more likely that the phenomenon will be reliably identified and reported to researchers. This is one reason that it is critical to balance the use of generic descriptions of sleep paralysis with the inclusion of local terms when conducting night-mare research. For example, psychologist Kazuhiko Fukuda and colleagues administered a sleep paralysis questionnaire to university students in Canada and Japan and found that, although there were no significant differences in the prevalence or symptoms of sleep paralysis, Canadian students tended to vaguely dismiss the experience as a "dream," whereas Japanese students clearly identified it as *kanashibari* (Fukuda et al. 1998).

The Sleep Ecology of Sleep Paralysis

Much of what is illuminating about considering scientific approaches to sleep paralysis is the comparison of purportedly "culture-free" experiences with instances of culturally embedded night-mares. A comparative strategy reveals key points of cultural variation not only in the night-mare, but also in the construct of sleep paralysis. Our current scientific understanding of sleep, for instance, is limited by the kinds of people that have been studied and by the contexts in which sleep has been investigated. Although all human beings sleep, not everyone sleeps in the same way. It has taken scientists an extraordinarily long time to realize that sleep is not purely "natural" (that is, biological) but is, in fact, deeply embedded in culture. Even anthropologists have only recently begun to consider the cultural context of sleep practices. How, when, and where do human beings sleep? Is sleep conducted in one sustained block of nocturnal time; in a biphasic manner, with a large period of nocturnal sleep and shorter afternoon one; or is it polyphasic, as in the so-called "napping cultures" of Japan and China? (Steger and Brunt 2003).

Sleep research has typically been conducted among middle-class Westerners who have grown up in and been habituated to a specific set of sleep ecologies.[2] These settings, although "successful research paradigms for elucidating dimensions of sleep patterning, physiology, regulation, and clinical correlates, may also of necessity and at times inadvertently eliminate variation that is crucial for understanding the full potential range of 'normal' sleep, as well as the causes and consequences of individual variability, normal and pathological" (Worthman and Melby 2002, 106). Distinctive features of these environments may influence the sleep behavior and physiology of research participants and thus affect both the resulting data and the models developed from them. Sleep laboratories, because of their aims as well as their locations, have provided a faithful reflection of the particular cultural ecology of Western sleep.

> Available sleep data generally are drawn from subjects who habitually sleep alone or with one other person and who have a developmental history of chronic solitary sleep. Western sleepers practice routinized bed- and wake-times strongly entrained to work or school, and again have done so throughout development. Hence, their sleep is highly bounded and consolidated, frequently restricted or curtailed by scheduling constraints, and preferably ungarnished by other forms of somnolence. Sleep is achieved and maintained in sensorily static and deprived (but potentially cognitively dense) conditions. In other words, the Western sleepers have lifetime habituation to many of the sleep conditions represented in the laboratory, and they tend to practice a "lie down and die" model of sleep. (Worthman and Melby 2002, 107)

The sleep patterns of most laboratory sleep subjects contrast sharply with those of people in many different parts of the world. In the United States, "patterns of solitary sleep on heavily cushioned substrates, consolidated in a single daily time block, and housed in roofed and solidly walled space" are quite distinct from the variety of sleep conditions found in many traditional societies, including "multiple and multi-age sleeping partners; frequent proximity of animals; embeddedness of sleep in ongoing social interaction; fluid bed times and wake times; use of the night time for ritual, sociality, and information exchange; and relatively exposed sleeping locations that require fire maintenance and sustained vigilance" (Worthman and Melby 2002, 70).

For the purposes of better understanding the night-mare, one of the most significant differences across cultural settings is the boundary between wakefulness and sleep. The distinction made between the two states is not uniform, and it seems to be linked to housing construction and patterns of social and ritual activity. "Sleep in . . . traditional societies is collective, and it occurs in social space; yet, at the same time, it is usually conventional to leave the sleeper alone, spared of undue disturbance, as the boundary of wake and sleep is fluid" (Worthman and Melby 2002, 79–80). The tradition of the wake/sleep dichotomy, of course, like that of the natural/supernatural world, is culturally and historically constructed and not universally accepted. The night-mare, by straddling what science teaches us are two distinct states—asleep and awake—violates our conception of consciousness. It is particularly disturbing because of the boundary that is so fiercely maintained between the rational (waking) and irrational or fanciful (sleep/dream). The scientific model of sleep status may thus represent a specific cultural approach that happens to highlight both ends of a spectrum and de-emphasize the intervening gradations. "In other societies, sleep behaviorally, and perhaps conceptually, may be on a continuum of arousal where other modes (from, for instance, disengaged semialert, to somnolence or drowsing, to dozing, to napping) are more tolerated and perhaps more prevalent" (Worthman and Melby 2002, 102). This cross-cultural diversity in sleep patterns and ecologies is significant because specific cultural settings and practices may be associated with distinctive risks for disorders of sleep.

Sleep Paralysis as a Biologically Structured Event

The (Re)Discovery of the REM Sleep Period

Perhaps the single most important event for the biomedical understanding of the night-mare was the discovery of the periodically occurring rapid eye movement (REM) sleep phase. Although it was commonly understood that eye movements often accompany sleep, no one had recorded eye movements throughout the course of an entire night's sleep. In 1953, after spending countless hours observing sleeping infants as part of his graduate work, Eugene Aserinsky

applied polygraph technology to the study of nocturnal eye movements. In his early experiments, Aserinsky enlisted the aid of his own eight-year-old son. What he discovered was so unexpected, that for some time he suspected that the equipment was malfunctioning. "I noticed to my chagrin that the machine was acting up again, [with some recordings] that looked suspiciously like the saccades I had observed when my son moved his eyes voluntarily during the calibration prior to sleep" (Aserinsky 1996, 217). Because of this seemingly anomalous finding, Aserinsky was compelled to reconsider a limited number of possibilities for the cause of these eye movements, including what he considered the least likely, that the "hoary anecdotal reports tying eye movements to dreaming might indeed be true" (217).[3] Aserinsky recalls from his subsequent work with sleeping adults: "In one of the earliest sleep sessions, I went into the sleep chamber and directly observed the eyes through the lids at the time that the sporadic eye movement deflections appeared on the polygraph record. The eyes were moving vigorously, but the subject did not respond to my vocalization. There was no doubt whatsoever that the subject was asleep despite the EEG [electroencephalogram] suggesting a waking state" (218).[4]

Stages of Sleep

As a result of the foundational sleep studies conducted in the mid-1950s, sleep researchers began to differentiate between two categories of sleep, Rapid Eye Movement (REM) and Non-Rapid Eye Movement (NREM), each with what are now recognized as a characteristic set of physiological, neurological, and psychological features. REM sleep is distinguished by brain waves resembling those of wakefulness. In contradistinction to the waking state, however, the body is paralyzed, apparently to keep the sleeper from acting out his or her dreams.[5] Sleep typically is arranged in ninety-minute cycles consisting of three stages of progressively deeper NREM sleep, followed by one stage of REM. (A system for staging sleep was established in 1968 by Allan Rechtschaffen and Anthony Kale, and it remained officially unchanged until the American Academy of Sleep Medicine updated the staging guidelines [Iber, Ancoli-Israel, Chesson, et al. 2007].)

Stage N1 (for NREM 1) sleep is a phase of somnolence or drowsiness. Polysomnography shows a 50 percent reduction in activity between wakefulness and this first stage of sleep. The eyes are closed and the "sleeper" loses some muscle tone and conscious awareness of the external environment, but, if aroused from N1, a person may feel as if he or she has not slept. Stage N1 lasts for five to ten minutes. Sudden twitches and muscle jerks (known as positive myoclonus) are also associated with the onset of sleep during N1. The muscles begin to slack and go into a restful state as a person is falling asleep. The brain apparently senses these relaxation signals and misinterprets them, thinking the sleeper is falling down. The brain then sends signals to the muscles in the arms and legs in an attempt to jerk the body back upright.[6] Psychologist Frederick Coolidge suggests

that this is a vestige from our time as tree-dwelling primates, when there was a selective value to readjusting sleeping positions to prevent a fall (Coolidge 2006).[7]

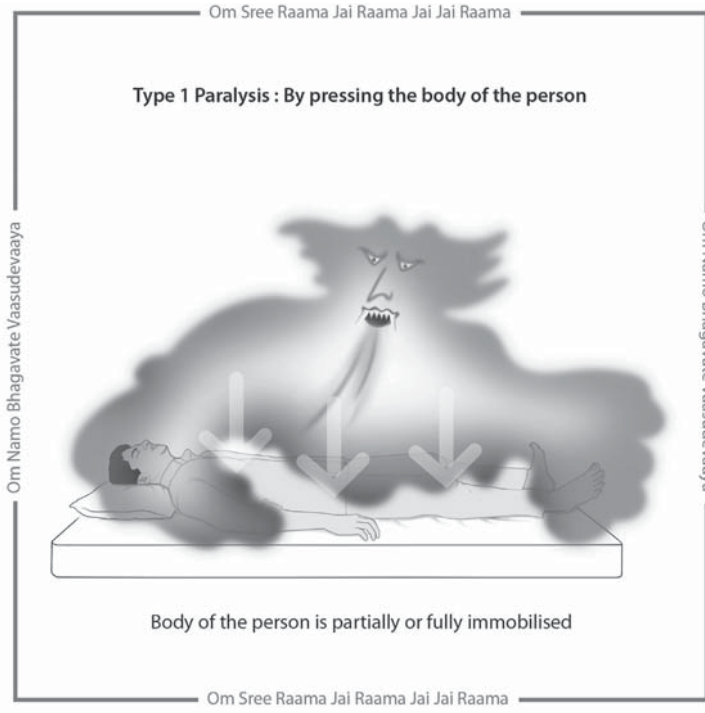
Stage N2 is a period of light sleep during which muscular activity decreases, heart rate slows, body temperature decreases, and conscious awareness of the external environment disappears. At this point, the body prepares to enter deep sleep. N2 comprises 45–55 percent of total sleep.

Stage N3/4 is characterized by deep and slow-wave sleep. Night terrors, bedwetting, sleepwalking, and sleep-talking occur during this phase. Stage N4 had previously been thought of as a deeper version of N3, in which the deep-sleep characteristics are more pronounced. Under the new AASM guidelines, however, the distinction between Stages 3 and 4 of NREM sleep is viewed as inconsequential and both are considered slow-wave sleep. As of 2007, therefore (in an effort to increase the precision of sleep scoring guidelines), stage N4 is no longer officially coded separately in AASM sleep centers.

REM sleep is easily distinguished from NREM sleep by physiological changes, including the characteristic rapid eye movements. Polysomnograms, however, show brain-wave patterns in REM to be similar to those of N1 sleep. In normal sleep (that is, in people without disruptions of sleep-wake patterns or REM behavior disorder), a person's heart and respiration rates accelerate and become erratic, while his or her face, fingers, and legs may twitch. Because of heightened brain activity, intense dreaming occurs during REM sleep, but paralysis occurs simultaneously in the major voluntary muscle groups. Since REM sleep is thus a combination of states of brain excitement and muscular immobility, it is sometimes called "paradoxical sleep" (Jouvet 2001). REM-associated muscle paralysis (or atonia) functions to prevent the body from acting out the dreams that occur during this intensely cerebral stage. In a typical night's sleep, the first period of REM lasts ten minutes, and each recurring REM phase lengthens until the final one lasts one hour. REM sleep is also homeostatically driven—if a person is deprived of sleep, there are progressively more frequent attempts to enter REM and a compensatory rebound after the sleep deprivation ends.

How the Night-mare Manifests in the Sleep Lab

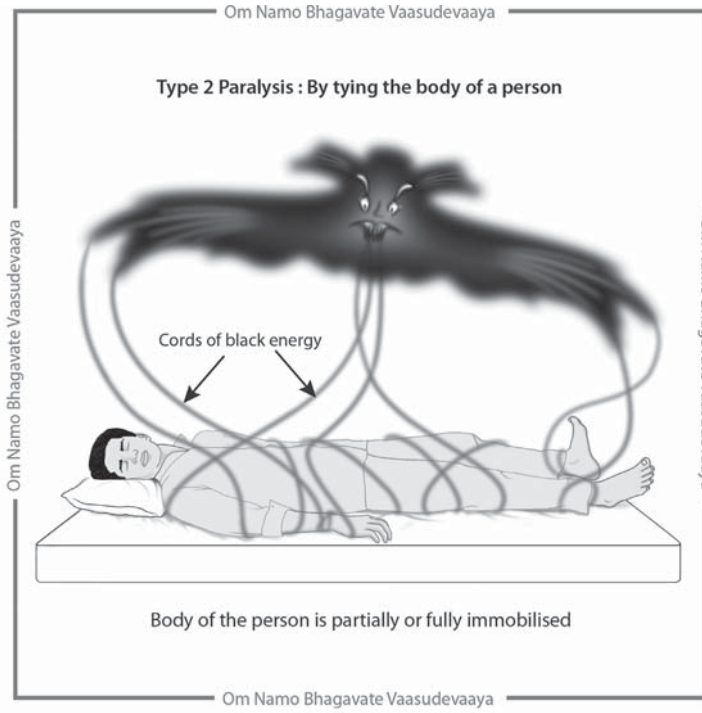
Sleep paralysis may occur during sleep-onset or sleep-offset REM (Hishikawa and Shimizu 1995), the result of a REM state that occurs "out of sequence" while the sleeper is still partially conscious. This overlap causes sleep paralysis, a stage in which the body is asleep but the mind is not. The best way to understand this state is to think of REM characteristics, including muscle atonia, overlaid on waking consciousness. (See Illustration 4.1 for a depiction of a "sleeper" paralyzed during a night-mare.) Often, sleep paralysis is also accompanied by dream-like hallucinations which consist of complex visual, auditory, and somatosensory perceptions that occur as a person is falling asleep (in which case the hallucinations are referred to as hypnagogic, from the Greek words *hypnos* ["sleep"] and *agogos*



4.1. Depiction of Immobilization during Sleep Paralysis. This illustration was provided by the Spiritual Science Research Foundation (SSRF), a nonprofit organization that, over the past twenty years, has conducted spiritual research. A representative of SSRF explained that the organization's intention is "to demystify the spiritual realm and provide research that will help humanity to effectively alleviate difficulties in life and progress spiritually in a very practical manner." The text circumscribing the illustration is a Sanskrit mantra. The chants are "a subtle protective border which does not allow negative energies to spread their black energy onto anyone who is looking at the drawing. The visual drawing of a negative energy also carries its associated energy. So we kindly suggest that those chants remain."

["leading"]) or waking up (hypnopompic hallucinations, from *pompe* ["procession"]). Both David Hufford (1976, 1982) and Robert Ness (1978) argue convincingly that these out-of-place REM stages account for the subjective impression of wakefulness, the feeling of paralysis, and, understandably, the tremendous anxiety that mark the night-mare experience. It is important to remember that paralysis is a normal physiological correlate of REM sleep; it is the consciousness of the paralysis that is "abnormal."

More recent research has confirmed and elaborated upon earlier findings regarding the relationship between night-mare encounters and sleep-onset/offset REM. For example, features of the night-mare are consistent with several



4.2. Depiction of Pressure during Sleep Paralysis.
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characteristics of REM respiration, including shallow rapid breathing, hypoxia (an inadequate oxygen supply), hypercapnia (a high level of carbon dioxide in the blood), and occlusion of the airways (Cheyne, Rueffer, and Newby-Clark 1999). Both tidal volume and breathing rate are sometimes quite variable during REM sleep, and because major anti-gravity muscles are paralyzed, the chest contributes less to breathing during REM than during NREM sleep (Douglas and Polo 1994). Even in the absence of apnea or blood chemistry changes, people will sometimes attempt to breathe deeply, just as they try to make other movements during sleep paralysis (Hishikawa and Shimizu 1995). When a sleeper's efforts to control breathing are unsuccessful, the sense of resistance can be interpreted as pressure. (Illustration 4.2 depicts the "pressure" of a night-mare attack.) The sense of oppression or weight on the chest and the common feature of lying in a supine position can be explained by the fact that when the sleeper is on his or her back, the atonic muscles of the tongue and esophagus collapse the airway. The relaxed muscles not only hinder breathing, but they can also create a sensation of pressure or strangulation (Adler 1994). The awareness of increased airflow resistance that can occur during sleep paralysis leads to panic and strenuous efforts to regain control (Cheyne, Rueffer, and Newby-Clark 1999).

In addition to these common night-mare features that fit into the known neurophysiology of REM sleep, the sexual nature of some night-mare encounters may be similarly related to REM characteristics. If physiological processes are elaborated into night-mare content generally, then the same is likely true for the concomitant occurrence of increased sexual arousal in women and men during the REM stage. The occurrence of sexual processes in sleep-onset/offset REM may thus be incorporated by the semiconscious mind into the experience of the night-mare.

During sleep paralysis, individuals are aware of their surroundings and can open their eyes, but they are unable to move (Hishikawa 1976). Not surprisingly, an acute sense of fear or doom often accompanies the various hypnagogic and hypnopompic experiences that occur with sleep paralysis. For the sake of simplicity, I will use the term *hypnic* to indicate the timing of these strange sensory experiences, whether they occur upon falling asleep or awakening. Sleep paralysis hallucinations are, in effect, the "superpositioning of dream imagery and affect on waking consciousness" (Cheyne 2001, 134). These hypnic experiences include a strong sense of a monitoring "evil presence"; combinations of auditory and visual hallucinations; pressure on the chest; and sensations of suffocating, choking, floating, flying, and being "out of body" (Hishikawa 1976; Hufford 1976). Although these features are in some ways similar to images and sensations that are unrelated to sleep paralysis (e.g., Foulkes and Vogel 1965; Mavromatis 1987; Rowley, Stickgold, and Hobson 1988; Schacter 1976), hypnic experiences that occur with sleep paralysis seem to be significantly more intense and horrifying (Cheyne, Newby-Clark, and Rueffer 1999; Hufford 1982; Takeuchi et al. 1992). In spite of the compelling nature of hypnic hallucinations, however, people may be easily aroused from the state of sleep paralysis by external tactile and auditory input (Hishikawa 1976)—typically a touch by someone who has noticed the sleeper's distress.

What the Night-mare Is Not: Night Terrors, Bad Dreams, and Narcolepsy

The problem of distinguishing the night-mare experience from other sleep disorders—particularly night terrors, bad dreams, and narcolepsy—persists. Ironically, "folk observation is ahead of scientific observation. Without sleep laboratories and without polygraphs, folk tradition apparently maintained an awareness of the distinction between REM intrusions into wakefulness and REM occurring in its proper places" (Hufford 1982, 166). The night-mare experiencers' observations were correct; they were "awake," and they were having anomalous experiences. Scholars' rejection of this observation delayed progress in night-mare research and resulted in much scientific confusion.

> Even the most preposterous explanation should not prevent us from seriously considering an observation repeatedly made by large numbers of

> our fellow humans, whatever their education. It was just such a rejection of untutored observation that delayed for so long the "scientific" discovery of giant squid, gorillas, meteors, and any number of other wild and wonderful (but apparently unlikely) facts of this world. In those cases, *post hoc* scientific rationalization was used to explain how people came to believe in such things. Seasoned fishermen were said to mistake floating trees with large root systems for huge animals attacking their boats; farmers were said to have overlooked large iron-bearing rocks in the midst of their fields until they were pointed out by lightning; and in this case, "children and savages" were said to have difficulty knowing when they were awake and when they were asleep. (Hufford 1982, 166)

Given the continuing confusion, further misunderstandings are probably best prevented by considering recent findings in sleep research in order to differentiate among the three parasomnias, or sleep disorders, most often confused with the night-mare: night terrors, bad dreams, and narcolepsy. Sleep paralysis, as we have seen, is the result of REM atypically intruding into N1 sleep. Night terrors or sleep terrors, in contrast, are spontaneous awakenings from N3/4 sleep, usually during the first one-third of the sleep period. Night terrors, which occur most frequently in childhood, manifest when a person sits up in bed with a loud scream or cry and a look of intense fear. Adults may jump out of bed and run, attempting to leave through a door or window. The "sleeper" is typically unresponsive and will be confused and disoriented if awakened. Any efforts to console the person only prolong or intensify the episode. There is usually no memory of the incident in the morning. About 2 percent of adults and up to 6 percent of children experience night terrors (Schenck 2007).

Generic bad dreams (or, confusingly, "nightmares" in everyday language) are disturbing mental experiences that occur during REM and often result in awakenings from sleep. Bad dreams have coherent narrative sequences that seem real and become increasingly more disturbing as they unfold. These dreams tend to focus on imminent physical danger or other distressing themes. Anxiety or fear is typically associated with these experiences, but emotions of anger, rage, embarrassment, and disgust are common. In addition, the fear that is provoked by a bad dream is qualitatively different than the intense horror and sense of doom that are common results of the night-mare encounter. The sleeper is often able to recall clear details of a bad dream after awakening, and there is little confusion or disorientation (Schenck 2007).

Unlike the other parasomnias, narcolepsy is associated with sleep paralysis in some individuals, but isolated sleep paralysis is overwhelmingly more prevalent in the general population. Narcolepsy is a neurological sleep disorder that creates a potentially disabling level of daytime sleepiness. The cause of most cases of narcolepsy is the loss of neurons that contain hypocretin, a protein that

helps the brain maintain alertness (Schenck 2007). This sleepiness may take the form of repeated and irresistible bouts of sleep, during which a person suddenly falls asleep in unusual situations, such as while eating, walking, or driving. Most people tested with narcolepsy fall asleep in an average of less than eight minutes (often less than five minutes). They also show a tendency to enter the REM stage of sleep much faster than normal sleepers—it is this feature that results in narcoleptics' relatively high rate of sleep paralysis. The primary distinguishing features of most cases of narcolepsy are excessive daytime sleepiness (inability to stay awake and alert during the major waking periods of the day), cataplexy (a sudden loss of muscle tone that occurs most often in the knees, face, and neck), sleep paralysis, and hypnagogic hallucinations (Kryger, Roth, and Dement 2000). Less than 1 percent of the general population has narcolepsy, compared with 25–30 percent who experience sleep paralysis.

Sleep Paralysis and the Night-mare

Sleep paralysis and the night-mare are the same phenomenon described and experienced through different paradigms (biomedical versus cultural). Some of the most innovative and important work in reconciling the neurophysiology of sleep paralysis with the experience of the night-mare has been conducted by psychologist J. Allan Cheyne and his colleagues at the University of Waterloo in Ontario. In order to study what Cheyne refers to as "waking nightmares" in the general population, he developed the Waterloo Unusual Sleep Experiences Questionnaire, which has been completed by over 12,000 respondents to date. The primary purpose of the survey is to assess the frequency and intensity of sleep paralysis, as well as the qualitative features of the hallucinatory experiences that frequently accompany sleep paralysis. The questionnaire assesses respondents' experience with a range of hypnic occurrences, including sensed presence; visual and auditory hallucinations; pressure on the chest; difficulty breathing; pain, choking, or smothering; motor movements (e.g., getting up, walking around, flipping light switches); floating, out-of-body experiences, falling, "elevator feelings," flying, or spinning sensations; and autoscopy (observing one's body from a perspective outside of the physical self). The questionnaire also assesses fear, anger, sadness, bliss, and erotic feelings. Respondents are asked to rate the intensity and frequency of each type of experience.

Cheyne and his research team found a high degree of structure in the patterning of hypnic experiences, with a clustering into three primary groups: (1) sensed presence, fear, and auditory and visual hallucinations; (2) pressure on the chest, breathing difficulties, and pain; and (3) "unusual bodily experiences," consisting of floating/flying sensations, out-of-body experiences, and feelings of bliss. A sensed presence is the most common experience reported, and fear is the most frequently noted emotion. The researchers emphasize

that many respondents spontaneously reported that they had never spoken to anyone about their experiences because they were afraid that they might be considered "weird." The survey participants "also indicated that they had thought their experiences were unique and expressed considerable relief upon discovering this was a known phenomenon" (Cheyne, Newby-Clark, and Rueffer 1999, 316).

Sleep research offers a scientific explanation for the major features of the night-mare and it accounts for other common elements, such as the "evil presence." We know that the motor paralysis of REM can lead to the experience of breathing difficulties when a sleeper tries to inhale deeply, and that this is sometimes experienced as sensations of choking or suffocating. This inability to breathe deeply may also be interpreted by the sleeping brain as being caused by a weight or pressure on the chest. From a sleep science perspective, there is a cascading series of events initiated by motor inhibition that lead to experiences of breathing difficulties, pressure on the chest, and ultimately a sense of physical assault (Cheyne, Rueffer, and Newby-Clark 1999). The impression of a nearby threatening presence with corroborating visual and auditory evidence provides an "agent" to perpetrate the experienced assault: "The mapping is such that little needs to be added to this cluster of [sleep-onset/offset REM] experiences and everything available fits well with a narrative of assault by a strange intruder" (Cheyne, Rueffer, and Newby-Clark 1999, 333).

Cheyne and colleagues propose that the major initiating event of hallucinations of a nearby, threatening person or entity is the experience of a sensed presence accompanied by intense fear. As the sleep paralysis episode continues, the sensed presence provokes continuing efforts to establish the true meaning of the experience, as well as increasingly elaborate interpretations of accompanying hypnic hallucinations consistent with an external threat. In other words, the brain strives desperately to make meaning out of the anomalous sensations. The hallucinations can arise from within the body, through ocular or middle ear activity, or from outside the body as shadows and ambient sounds. These sensations are frequently interpreted as "approaching footsteps, whispering voices, or apparitions that are taken to be concrete instantiations of the threatening presence" (Cheyne, Rueffer, and Newby-Clark 1999, 322).

In contrast to experiences centered on an evil presence or sense of pressure, other hypnic sensations do not necessarily imply threatening external agency but are instead associated with bodily orientation and movement in space. These experiences are typically not passive sensations; they consist of more vigorous sensations of flying, acceleration, and "even wrenching of the 'person' from his or her body." In response to questions about these sensations, study participants "spontaneously reported a variety of inertial forces acting on them, which they described as rising, lifting, falling, flying, spinning, and swirling sensations or similar to going up or down in an elevator or an escalator, being

hurled through a tunnel, or simply accelerating and decelerating rapidly" (Cheyne, Rueffer, and Newby-Clark 1999, 331).

In the waking state, the vestibular system is responsible for our balance and sense of spatial orientation. During REM, activity in the vestibular system increases, but, because the body is asleep, this activity occurs in the absence of accurate information about the position and motion of the body and limbs. In other words, the natural vestibular activation of REM occurs without corroborating somatosensory information or with conflicting information. In the absence of (accurate) feedback, the resulting sensations are interpreted as floating or flying or one of a number of other unusual bodily sensations (Cheyne and Girard 2008). This irreconcilable conflict between moving and not moving "is resolved by a splitting of the phenomenal self and the physical body, sometimes referred to as an out-of-body experience" (Cheyne, Rueffer, and Newby-Clark 1999, 331). (One does not have to be in an anomalous state for the vestibular system to become confused. If you are sitting in a train at rest in a station when the train on the next track begins to move, the conflicting sensory input is likely to cause you to experience a vivid, if brief, illusion of movement.)

Although out-of-body experiences, especially those accompanying trauma and/or seizures, can be associated with fear (Devinsky et al. 1989), studies in broader populations find that some people describe feelings of calm, peace, and joy that are sufficiently positive to create the desire to repeat these experiences. This positive association seems to be particularly common among people who practice meditation and find themselves able to experience a feeling of transcendence (Cheyne 2001).

The Primordial Narrative of the Threatening Intruder

Cheyne and colleagues present the intriguing hypothesis that the sensed presence and related hallucinations in the sleep paralysis arise from hypervigilant defensive states initiated in the mid-brain. Under these circumstances, the sleeper is extraordinarily alert to environmental events potentially associated with danger. The feelings of presence that emerge during sleep paralysis thus arise from the same neurophysiology that underlies threat detection.

> The sensed presence is typically described as a monitoring one, akin to a predator stalking its prey. A threatening, malignant or evil intent is frequently ascribed to the presence. Respondents are often at pains to express the intensity and depth of the accompanying terror. In addition, bodily sensations of crushing and painful pressure on the chest, back, side and neck may be interpreted as a full-fledged and potentially mortal attack by the presence. (Cheyne, Rueffer, and Newby-Clark 1999, 322)

During sleep paralysis, REM-based activation of the vigilance system produces (in the absence of an external threat) an ambiguity that cannot be conventionally resolved—this condition is experienced as an extremely threatening sensed presence. During sleep-onset/offset REM, the sensed presence may serve to give meaning to the visual and auditory hallucinations that are occurring simultaneously. When the "triggers" are internal, the sense of threat cannot be immediately corroborated and the sleeper's sense of fear takes on an otherworldly quality and intensity. I would suggest, in addition, that as the brain frantically attempts to comprehend why its motor commands are not being followed, a spiral of increasingly fearful thoughts is formed. This is, in essence, a type of nocebo effect: through the "power of negative thinking," the vague sense of threat and its anticipated horror are realized.

Visual hallucinations thus may represent attempts by the brain's threat detection mechanisms to explain and literally "flesh out" the sensed presence. Auditory hallucinations (e.g., approaching footsteps, demonic whispering) may similarly arise from the results of random activation of auditory centers during REM that are made "meaningful" by the brain. It is clear from talking with night-mare sufferers, though, that even when the hallucinations provide an "explanation" of the event, it is, at best, only an incomplete resolution of the anomaly—and the night-mare experience retains its otherworldly quality. It is very common for night-mare sufferers to spontaneously and strenuously assert that the terror they experience is unlike any real-world fear that they have ever known. This terror is evocative of the "numinous" sensation described by the theologian and religious scholar Rudolf Otto as the ineffable sense of a sacred or demonic presence (1926). Otto explains that a sensed encounter with the supernatural causes a numinous reaction that is qualitatively different from all other emotions. The combination of fear, awe, and abasement in the presence of a greater power (such as that which a person feels during a supernatural encounter) forms a composite emotion that is like no other (Adler 1991). The experience of the numinous is one of "terror fraught with an inward shuddering such as not even the most menacing and overpowering created thing can instill" (Otto 1926, 14).

Stress and Sleep Disruption as Precursors to Sleep Paralysis

Findings from sleep research offer explanations not only for the features of the night-mare, but also for its causes and "cures." Stress, anxiety, sleep disturbances, and sleep deprivation (which often co-occur) are the most common precursors of sleep paralysis.[8] When interviewed about the night-mare, people often spontaneously mention that they were under a lot of stress during episodes. Periods of stress are associated with difficulty falling asleep (leading to sleep deprivation), as well as multiple and extended awakenings during the night and early waking (both of which have a relatively greater impact on REM

sleep). Insufficient amounts of REM sleep can lead to sleep onset-REM in subsequent sleep. People who do shift work or night work have been shown to suffer from disrupted sleep-wake patterns, sleep deprivation, and, not surprisingly, sleep paralysis (Kotorii et al. 2001). The situation is sufficiently common among nurses who work long and irregular shifts that it has been known as "night nurse paralysis" (Folkard, Condon, and Herbert 1984). Nurses have reported becoming aware of these sleep paralysis episodes when a patient calls and they find themselves unable to move to respond to the request. There are many other work-related situations in which there are enormous safety implications for people who find themselves incapacitated by sleep paralysis, including those of air traffic controllers (Folkard and Condon 1987)[9] and physicians (Weinger and Ancoli-Israel 2002).

The historical record seems to confirm that stress, anxiety, and strenuous activity—because they involve irregular sleep—increase the chances of sleep paralysis. There is an account of a panic in Breslau (modern-day Wrocław, Poland) during the late sixteenth century that was caused by visitations of the ghost of a shoemaker who had committed suicide. The revenant came to some people at night, lay on them, and smothered and "squeezed" them hard. The people "most bothered were those who wanted to rest after heavy work" (Barber 1988, 12). In another example, during the late nineteenth century, an elderly Scottish woman explained: "When the females of a house had all the work, and were 'stinted' to do a given amount of work at the spinning wheel before they got any supper, and so much before they went to bed, they were very liable to take the 'Mare' owing to anxiety connected with their stints" (Ducie 1888, 135).[10] Even today, accounts of night-mare experiences often include a description of irregular sleep. According to one American soldier: "Being in the army, my sleep patterns are very 'scattered.' I usually get 4 hours a night at different times and I nap during the day whenever I can. I get sleep paralysis on average once to twice a week. I HATE IT. You don't want this to happen to you. It scares the daylights out of me every time I experience it. I feel like I'm dead" (Internet posting, ASP-L).

The impact of age is another factor in the occurrence of sleep paralysis. Tsuyoshi Kotorii and colleagues conducted a sleep survey with more than eight thousand people in Japan and found that "many young people have irregular life rhythms or delayed sleep, and there is the possibility that disturbances in sleeping and awakening rhythm may increase the experience rate of sleep paralysis. . . . Although the frequency of insomnia increases with age, the cumulative experience rate of sleep paralysis decreases with age" (Kotorii et al. 2001, 266).[11] The greater the degree of insomnia, the higher the cumulative experience rate of sleep paralysis. The interruption of sleep caused by insomnia and higher levels of anxiety appear to increase the cumulative experience rate of sleep paralysis.

There have been a host of reports in both the scientific and popular media in recent years that call attention to the prevalence and dangers of chronic sleep

deprivation (e.g., Revill 2006; Van Dongen et al. 2003). Any kind of stress can be disruptive of sleep patterns, but when the stressor itself is the interruption of sleep, the effect is significantly more dramatic. Repeated episodes of sleep deprivation/disruption and sleep paralysis may create a vicious cycle. It is ironic that life in the contemporary United States removes many cultural narratives that give meaning to the events of sleep paralysis but creates conditions that increase its incidence.[12]

Preventing Sleep Paralysis

In the absence of cultural traditions, the Internet is a resource for popular suggestions about how to elude sleep paralysis. One British Web site makes the following representative recommendations: "Keep to a regular schedule. Go to bed and get up at regular times. Eat your meals at regular times. Get some exercise, although not too close to bedtime. Avoid sleep deprivation—make sure you get enough sleep. Find ways to reduce stress in your life. Try to avoid sleeping on your back" (Sleep Paralysis Information Service 2009). With the exception of avoiding the supine position, suggestions like these are indistinguishable from contemporary generic tips for "healthy living," and they have not progressed far from the advice commonly given more than two centuries ago:

> If the disorder proceed from heavy suppers, or indigestible food, these things ought to be given up, and the person should either go supperless to bed, or with such a light meal as will not hurt his digestion. . . . In all cases, the patient should take abundant exercise, shun late hours . . . and keep his mind in as cheerful a state as possible. . . . He should be directed to lie as little as possible on the back. (MacNish 1834, 27)

Strategies suggested by contemporary sleep scientists for preventing sleep paralysis also overlap with traditional actions taken against the night-mare. Since lying in a supine position is five times more likely during sleep paralysis than during normal sleep, people hoping to prevent the disorder are advised to avoid sleeping on their backs. Sleeping supine, however, appears to be relatively rare—for example, only 10–15 percent of people in a large Canadian study reported that they normally sleep in this position (Cheyne 2002). Because about 60 percent of sleep paralysis episodes are reported to occur in the supine position, many people clearly find themselves in what is for them an atypical sleep position.[13] Unfortunately, this means that people who experience sleep paralysis may be no more likely to be lying on their backs when normally falling asleep than people who do not experience them. (In addition, those who typically fall asleep on their backs do not report greater frequency of sleep paralysis or associated hallucinations.) Sleep paralysis thus usually occurs when susceptible individuals inadvertently turn to the supine position as they fall asleep or when

they change positions during sleep, particularly when they enter or leave the REM stage. Avoiding the supine position only when falling asleep, therefore, is not enough. To address this problem, scientists and clinicians sometimes recommend the "sleep-ball" or "tennis-ball technique," which originated as a remedy for positional sleep apnea (Skinner et al. 2008). In this technique, a tennis ball is placed in a pocket that has been sewn onto the back of pajamas or placed in a sock that is safety-pinned to the back of a nightshirt, thus preventing the night-mare sufferer from sleeping comfortably on his or her back.

In addition to altering sleep position, another preventive measure based on sleep research, but familiar from folk tradition, is the attempt to make small motions to end the episode. As psychiatrist Carlos Schenck describes: "Your bigger muscles may be frozen, but it may be possible to direct the smaller ones—the fingers and toes in particular. Often just one small movement of a finger is enough to break the paralysis. If you can't move your fingers, try shifting the eyes back and forth" (Schenck 2007, 174). Finally, the centuries-old strategy of avoiding overindulgence in food or drink before bed is still strongly advised (Cheyne 2002).

Luring the Night-mare: Inducing Sleep Paralysis

Every aspect of sleep paralysis does not necessarily map onto each night-mare experience. The range of sleep paralysis symptoms is broader than the defining features of a night-mare—and the feeling of weight or pressure that is often a central feature of the night-mare encounter is not always a component of sleep paralysis experiences. People describe a number of different sensations during the transition to or from sleep, including flying, rising, spinning, accelerating, and hurtling through a tunnel—all sensations that, although not part of a classic night-mare encounter, may (albeit rarely) accompany sleep paralysis. An even smaller proportion of people describe out-of-body experiences in which they float above their beds and look down on their own bodies. Remarkably, this experience is usually described as pleasant, even blissful (Cheyne, Rueffer, and Newby-Clark 1999; Hufford 1982; Sherwood 2002; Terrillon and Marques-Bonham 2001). Emotions of joy or contentment contrast sharply with the sense of dread and awareness of an evil presence that accompany the typical night-mare, but both experiences are aspects of sleep paralysis (Davies 2003). Examples of out-of-body experiences are described by physicists Jean-Christophe Terrillon and Sirley Marques-Bonham:

> In the case of proprioceptive hallucinations, the individual feels that he, or part of himself, is at a different location from the physical body: he might feel phantom limbs or he has the subjective experience of slipping away from the physical body in what appears to be a phantom body.

> Subjective experiences of floating, rising, and occasionally rolling also occur. In addition, when experiencing an autoscopic hallucination, the proprioceptive hallucination is coupled with visual hallucinations: the individual, while in a floating state, can see the actual room, and eventually his physical body lying motionless on the bed. Or he can see a fictitious, dream-like environment characterized by vivid imagery, or even what seems to be a superposition of both the physical world and a dreamlike world. In all three cases he has a subjective experience of awareness and his experience is perceived to be real. (Terrillon and Marques-Bonham 2001, 108)

Because of the potential to have a transformative experience, there are occasionally Internet discussions about the use of sleep paralysis to produce out-of-body experiences: "There are some folks in this group who actually try to bring on [sleep paralysis] episodes who think it is a gateway to [out-of-body experiences], and others who are convinced that they are being visited by entities or beings from other dimensions. . . . The thought of wanting to have a [sleep paralysis] episode seems pretty crazy to me since my own episodes have been so terrifying" (Internet posting, ASP-L). A writer on another forum is blunter in responding to a request for sleep-paralysis-inducing techniques: "Put yourself under extreme stress all the time. I suggest being a substitute teacher by day, and moonlighting as an air-traffic controller. Seriously, sleep paralysis can be really terrifying. You'd do well to avoid inducing it on purpose" (Internet posting, www.abovetopsecret.com). Despite these warnings, there are people who intentionally induce sleep paralysis in order to have paranormal experiences. Techniques for using sleep paralysis as a "gateway" to the out-of-body state are shared on listservs, and the ability to take advantage of this sleep phenomenon is considered a gift by those who are able to overcome the terror (Proud 2009). This desire to transform sleep paralysis in order to cultivate positive experiences has created something of a cottage industry on the Internet. There are several Web sites that promise to disclose the secrets to "unlocking the potential of sleep paralysis" (for a fee). The following is representative of what is available:

> Pay close attention to what I'm about to tell you, or run the risk of ending up like the majority of other sleep paralysis sufferers out there, who become cursed by this condition for their entire lives. Don't say I didn't warn you. Wouldn't it be great to be able to stop these disturbing sleep paralysis episodes? To banish that evil old hag forever? Furthermore, imagine not just being able to stop them, but imagine learning how to actually enjoy them, and even induce them for your own entertainment. . . . I used to experience the evil presence. I used to feel my body turning hard like stone. I used to have terrifying monsters haunt me in the night. I used to hear a loud buzzing noise in my head. I used to feel a smothering and

> crushing sensation. I used to be sexually violated by unknown beings. I used to be afraid of dying when I closed my eyes at night. I used to think there was no escape. That is of course, until I developed sleep paralysis mastery.

Near-Death Experiences

Although the vast majority of sleep paralysis experiences are extremely disturbing, if not terrifying, there are clearly instances that provide reassurance and even positive transformation. One situation in which dissociation from the physical body can be accompanied by a euphoric or transcendental sensation is when a person is close to death. Raymond Moody introduced the term "near-death experience" in his 1975 book *Life after Life,* which was the first work to compile survivor anecdotes and bring the concept into the medical and popular literature.

> A man is dying and, as he reaches the point of greatest physical distress, he hears himself pronounced dead by his doctor. He begins to hear an uncomfortable noise, a loud ringing or buzzing, and at the same time feels himself moving very rapidly through a long dark tunnel. After this, he suddenly finds himself outside of his own physical body, but still in the immediate physical environment, and he sees his own body from a distance, as though he is a spectator. He watches the resuscitation attempt from this unusual vantage point and is in a state of emotional upheaval. (Moody 1975, 11)

The shared features are obvious: the initial ringing/buzzing sound, the tunnel, autoscopic and proprioceptive sensations. Terrillon and Marques-Bonham note other elements common to some sleep paralysis episodes and some near-death experiences, such as "a feeling of peace and ineffability, vivid and beautiful landscapes, a light that appears at the end of the tunnel and that is bright but does not hurt the eyes" (2001, 111). Like the night-mare, these types of near-death experiences are reported across a variety of cultural settings. As an Inuit woman explains, "It is like that for some people. They can see their body when they are sleeping. My husband almost died. When he woke up he said he had been dreaming. His *tarniq* [soul] was up above his body. When it went back down to his body he woke up. He said he regretted waking up because his *tarniq* had started to ascend" (Kolb and Law 2001, 194).

Although there are common themes, there are also reported differences in the features of near-death experiences from different cultures. An Australian research team of psychiatrists and social workers analyzed narratives of near-death experiences from around the world and found that, while there is acceptance of being "dead" and, hence, estranged from the body, the transcendence of the Western European model is not as prominent in narratives from other

cultures. Near-death experiences reported across Africa and in China, India, and Thailand, for example, had "more pragmatic themes such as the offering of food, being sent back because of errors, and a greater focus on good and evil. Meeting deceased relatives was also more common" (Belanti, Perera, and Jagadheesan 2008, 130). The researchers conclude that variability across cultures is most likely due to the interpretation and verbalizing of esoteric events through the filters of language, cultural experiences, religion, and education.[14]

Terrillon and Marques-Bonham suggest that there is an interesting association between the out-of-body experiences that can occur during sleep paralysis and (in what may at first seem to be a completely different circumstance) the traditional ability of shamans to leave their body at will and explore other realms of existence. "In . . . visionary states, the shaman is open to contact with animal allies and spirit helpers. Or the wizard may leave his or her body behind like a husk while the disincarnate soul journeys to the celestial realms above or the underworld of disease and death" (Halifax 1991, 18–19). According to this hypothesis, shamans have learned to control their out-of-body experiences and do not consider sleep paralysis to be an unwanted state of terror.

Neurologist Kevin Nelson and his research team at the University of Kentucky study the links among out-of-body experiences, sleep paralysis, and near-death experiences, and they conclude that some people's brains may be predisposed to these types of events.[15] An out-of-body experience is statistically as likely to occur during a near-death experience as it is to occur during sleep paralysis. "We found it surprising that out-of-body experience with sleep transition seemed very much like out-of-body experience during near-death" (University of Kentucky 2007). In their interview study with fifty-five people who had each had a near-death experience, the researchers noted that those who had an accompanying out-of-body experience were more likely to have experienced sleep paralysis than the age- and gender-matched control subjects. Nelson and colleagues suggest that, during a medical crisis, muscle paralysis combined with an out-of-body experience could show many of the major features of a near-death experience, including disassociation from the physical body, euphoria, and transcendental or mystical elements. This finding supports the idea that out-of-body experiences are an expression of arousal in near-death experiences and sleep paralysis. Almost all of the near-death subjects reported having sleep paralysis: "The strong association of sleep paralysis with out-of-body experiences in the near-death experience subject is curious and unexplained. However, persons with near-death experiences appear to have an arousal system predisposed to both REM intrusion and out-of-body experiences" (University of Kentucky 2007). Nelson and his research team explain that sensations related to sleep paralysis possess characteristics that are easily transformed into features of near-death experiences, such as the sensed presence of an entity or floating out of the body. Near-death experiences are also recalled with an intense sense

of reality and lack the bizarre characteristics of dreams. The researchers hypothesize that REM intrusion could form the basis of subjective phenomena strikingly similar to near-death experiences (Nelson, Mattingly, and Schmitt 2007). Ironically, while laboratory sleep research has thus made an enormous contribution to the scientific understanding of anomalous experiences, in addition to the comprehension of the night-mare's core features, it has simultaneously corroborated thousands of years of empirical evidence from night-mare sufferers.