9 An Assessment of Two Comprehensive Traditional Dream Theories

This chapter assesses the two most comprehensive, impactful, and widely known traditional theories of dreaming and dream content, the Freudian and Activation-Synthesis theories. Many dream researchers consider them passé and are critical of numerous aspects of both of them. However, some tenets of these theories, including their emphasis on unusual elements and emotions, continue to have an influence on the study of dreaming and dream content. These two theories, and especially Freudian theory, also continue to figure prominently in introductory psychology textbooks. Nor have the critics produced theories with the same scope. Instead, they are primarily focused on a variety of adaptive theories, which are discussed in detail in chapter 10.

The chapter begins with the oldest and most complete of the two theories, Freudian theory, which dates to the year 1900. It has been used and extended by psychoanalysts ever since, as well as by a few academic research psychologists into the 1990s. The chapter then turns to activation-synthesis theory, a product of the late 1970s, which has much to say about the nature of dreaming and about every aspect of dream content.

Freudian Dream Theory

Sigmund Freud's theory of dreams, as first presented in *The Interpretation of Dreams* (1900), proved to be the most impactful theory of dreams of the twentieth century, and it changed very little over that time span. Every theory in the first six decades of the century was an offshoot of it or a strong reaction against it. The functional aspect of the wide-ranging Freudian theory of dreaming begins with the assumption that dreams are

infrequent and brief. They are said to be similar to "a firework that has been hours in the preparation, and then blazes up in a moment" (Freud, 1900, p. 377).

According to this theory, dreams occur because the sleeping brain is trying to cope with basic physiological urges by turning them into psychological wishes that temporarily and partially satisfy these urges by means of a hallucinatory image. This stratagem is said to be in the service of preserving a vital bodily necessity, namely, sleep. The theory thereby linked dreaming to survival itself by claiming that dreams "serve the purpose of continuing sleep instead of waking up" (Freud, 1900, p. 180). More metaphorically, "*the dream is the guardian of sleep, not its disturber*" (Freud, 1900, p. 180; emphasis in the original).

However, laboratory findings nearly 60 years later revealed that adult dreaming is frequent, appears regularly in REM sleep throughout the night, may continue for 20 minutes or more in the two or three hours before awakening, and increasingly occurs in NREM 2 sleep as the brain becomes more active toward morning (Dement & Kleitman, 1957a, 1957b; Pivik & Foulkes, 1968; Wamsley et al., 2007; Zimmerman, 1970). Dreaming therefore cannot be triggered by episodic physiological needs represented in the mind as wishes. The theory is also directly refuted by laboratory studies of lobotomized schizophrenics, who slept soundly even though they did not report dreams from REM awakenings throughout the night (Jus, Jus, Gautier, et al., 1973; Jus, Jus, Villeneuve, et al., 1973). It is also called into serious question by the fact that preschool children rarely if ever dream and dream only infrequently from ages 5 to 9 (Foulkes, 1982, 1999, 2017; Foulkes et al., 1990), as discussed in chapter 6.

In the face of these strong findings, the hypothesis that dreams are the guardians of sleep has been defended by claiming dreaming may involve the "backward projection" of the impulses arising in the dopaminergic system (located in the basal forebrain) to the inferior parietal lobes and visual association cortex (Solms, 1997). Other dream researchers quickly noted there is little or no evidence that such a mechanism is responsible for dreaming (Antrobus, 2000). More recently, this possibility has been refuted by the evidence that a subsystem of the default network is the neural substrate that enables dreaming (Domhoff, 2011; Domhoff & Fox, 2015; Eichenlaub, Bertrand, & Ruby, 2014; Fox, Nijeboer, Solomonova, Domhoff, & Christoff, 2013; Uitermarkt, Bruss, Hwang, & Boes, 2020), as discussed in chapter 2.

In addition, Solms (1997) defends the guardian-of-sleep hypothesis on the basis of patients who reported the cessation of dreaming. Their replies to a questionnaire suggested they had disrupted sleep more often than did a control sample. However, those findings are not impressive in that 51% of the 101 patients with global loss of dreaming indicated that their sleep was not disrupted (Solms, 1997, pp. 164–165; Solms & Turnbull, 2002, p. 214). If dreaming is an important evolutionary adaptation necessary to preserve sleep, then virtually all patients reporting the complete loss of dreaming also should report an inability to sleep at all. Moreover, the two studies of over a dozen lobotomized patients in a sleep lab found they almost never recalled a dream after REM awakenings. They had normal REM/NREM cycles. They reported in the morning they had slept well, a claim supported by the EEG records of their sleep (Jus, Jus, Gautier, et al., 1973; Jus, Jus, Villeneuve, et al., 1973).

Although Freud's adaptive theory has been discarded by most dream researchers, it was the general starting point for the development of most of the adaptive theories, all of which were first proposed by clinical theorists influenced, directly or indirectly, by Freudian ideas. This generalization includes theories having to do with problem-solving and emotional regulation (see Dallett, 1973, for a historical account). These Freudian-influenced adaptive theories are discussed in chapter 10.

On the psychological level, the theory begins by explaining how memories of events from the previous day have a role in the process of dreaming. They create a connection to a disturbing wish: "a reference to the events of the *day just past* is to be discovered in every dream" (Freud, 1900, p. 127; emphasis in the original). By linking memories of seemingly trivial external events of the previous day to important internal physiological urges such as hunger, thirst, and sex, the theory thereby synthesized the emphasis on either external stimuli or internal physiological events in the nineteenth century, as reviewed in an early chapter in *The Interpretation of Dreams* (Freud, 1900, pp. 22–42). However, five studies refuted this conclusion decades ago when they found that only 44–58% of dreams contain any sign of day residue, as identified by the dreamer (Botman & Crovitz, 1989; Harlow & Roll, 1992; Hartmann, 1968; Marquardt, Bonato, & Hoffmann, 1996; Nielsen & Powell, 1992).

Nor could researchers, who collected statements from their participants about the events and concerns of the day, find significant involvement of

these events in the dream reports they subsequently collected in laboratory and nonlaboratory settings (Roussy, 1998; Roussy, Brunette, et al., 2000; Roussy et al., 1996). More generally, a very wide range of studies focused on the incorporation of numerous different types of stimuli and daily events have found no more than a few percent of such efforts are incorporated, even when the stimuli are very intense (Domhoff, 2017, pp. 25–33). Assessing the full range of laboratory studies of stimulus incorporation, which were carried out over the 35 years between 1958 and the early 1990s, one of the original dream researchers concluded: "Probably the most general conclusion to be reached from a wide variety of disparate stimuli employed, and analyses undertaken, is that dreams are relatively autonomous, or 'isolated,' mental phenomena, in that they are not readily susceptible to either induction or modification by immediate pre-sleep manipulation, at least those within the realm of possibility in ethical human experimentation" (Foulkes, 1996a, p. 614).

As part of his emphasis on the large role of specific memories in shaping dream content, Freud (1900, p. 266) said that all significant speech acts in dreams can be traced to memories of conversations heard or sentences read because "the dream-work is also incapable of creating speech." But an analysis of hundreds of speech acts in laboratory dream reports showed they are new constructions appropriate to the unfolding dream context, including the use by bilingual participants of the language relevant to the person to whom they are speaking in the dream (Foulkes et al., 1993; B. Meier, 1993). This Freudian assertion in relation to speech-acts, along with the claims about memories of the previous day as the instigator of all dreams, are relatively minor, but they are an indication of the degree to which the entire empirical basis of the theory is doubtful.

Turning to the more general theoretical level, Freud (1900, p. 106; emphasis in the original) claimed that wish-fulfillment "is the meaning of *each and every* dream." As one key piece of evidence for this claim, he claimed the dreams of young children are "invaluable as proof" of this theory because the wishes are clearly expressed (Freud, 1900, p. 102). This is a highly unlikely assertion about children's dreams if the findings from the longitudinal and cross-section studies of young children summarized in chapter 6 are taken seriously.

In the case of adults, on the other hand, Freud (1900, chaps. 4, 6) concluded that most of the wishes in their dreams are disguised by four cognitive

processes: *condensation* (two or more wishes expressed with one element), *displacement* (the expression of a wish via an unlikely element), *regard for representability* (does the element fit reasonably in the narrative being constructed), and *secondary revision* (the "final editing," so to speak, before the dream becomes "manifest" in the dreaming mind). Together, these four processes comprise the dream-work, which "imposes a censorship on the wish and by this censoring distorts its expression" (Freud, 1900, p. 113). The dream-work is said to be "peculiar to the life of dreams" and "far more remote from the model of waking thought than even the most determined belittlers of the psyche's feats of dream-formation have thought" (Freud, 1900, pp. 328–329). Freud (1900, chap. 4) devoted an entire chapter to the "dream distortion" purportedly created by the dream-work, which assumes that "two psychical forces" are "the originators of dream-formation in the individual; one of these forms the wish uttered by the dream, while the other imposes a censorship on the dream wish and by this censoring distorts its expression" (Freud, 1900, p. 113).

The deciphering of these dreams has to be carried out through the use of a process called "free association" during a therapeutic session, which requires patients to let their minds flow from waking thought to waking thought, without any self-censorship, in reaction to the dream in general or to each element of the dream that is mentioned by the therapist. In a book presenting a comprehensive assessment of all aspects of Freudian theory, based on empirical studies, not simply on dreams, the coauthors conclude there is no reliable empirical evidence that free associations lead inevitably to the meaning contained in dreams (S. Fisher & Greenberg, 1977, p. 66). This conclusion was confirmed by a failed large-scale effort to use the method as a research tool (Foulkes, 1978), which convinced the investigator, on the basis of "extensive experience in association gathering," that free association suffers from an "inherent arbitrariness" (Foulkes, 1996a, p. 617).

In addition, a psychoanalytically oriented study that used dream reports, free associations, and psychotherapy transcripts to identify the central personal conflicts of one male and two female patients, found free associations did not add to what independent judges could infer about the patients, based on the dream reports alone (Popp, Lubarsky, & Crits, 1992). Similarly, a study by Freudian-oriented researchers, in which dream reports were collected from participants in a laboratory study and then compared with material from their psychoanalytic sessions and structured interviews,

led them to conclude nothing further was added by the clinical materials, including free associations (Greenberg, Katz, Schwartz, & Pearlman, 1992).

Suggestion, Demand Characteristics, Cognitive Dissonance, and Persuasion in Therapeutic Settings

Moreover, and contrary to Freudian claims about the method of free association being free of any suggestive influence by the psychotherapist, there is evidence that it has grave shortcomings for research purposes, precisely because it is part of the psychotherapy process. Several possible confounds therefore may arise because of the many possible influences the therapist may have on the patient. These influences can be generally summarized as suggestion, demand characteristics, cognitive dissonance, and persuasion. The plausibility of applying these concepts to dream interpretations in a therapeutic setting was demonstrated in experimental studies in the context of simulated therapeutic relationships. In these studies, many of the unwitting participants gradually became convinced that one or another "planted" memory, which allegedly had been the basis for their dreams, had actually happened in their pasts (Mazzoni & Loftus, 1998; Mazzoni, Loftus, Seitz, & Lynn, 1999). The influence of these social-psychological processes also was demonstrated on the basis of interviews, transcripts, and court records in a case study of a dream-oriented therapeutic group and its clients. The group took on some of the trappings of a cult-like setting, which in turn led to revealing court cases (Ayella, 1998).

This line of analysis is supported by the fact that Freud (1900, pp. 114–119) often reported he had arguments with his patients when they denied his interpretations of their dreams as having wishful contents, which he further claimed were based on infantile desires and memories. He told them they were using the defense mechanism of "resistance" and that their therapy consisted in good part of understanding and overcoming this resistance. However, what Freud and later psychoanalysts understand as a need for their patients to overcome their "resistance" can be understood from the vantage point of social psychology as a process of persuasion and conversion. The patients' beliefs, based on their own memories, are set at odds with their respect for the expertise and healing powers of the therapist they hope will help them, and they often resolve the resulting cognitive dissonance by agreeing with the therapist.

This analysis does not demonstrate that all psychoanalytic sessions are exercises in suggestion, demand characteristics, cognitive dissonance, and persuasion. But it does mean the burden of proof is on Freudian researchers, when working in a therapeutic setting, to demonstrate the therapeutic data they use are not confounded by any of these four processes.

The Lack of Evidence for the Dream-Work as the Basis for Dream Content

Freud (1900, pp. 397–401) believed that the dream-work carries out its efforts to disguise unacceptable wishes at the behest of the cognitive process of repression. He also claimed the process of repression led to the forgetting of most dreams (Freud, 1900, pp. 337–338). But there is no experimental evidence for the existence of this process (Loftus, Joslyn, & Polage, 1998; Loftus & Ketcham, 1994; Otgaar, Howe, Patihis, Lilienfeld, & Loftus, 2019). In addition, research on the relationship between frequency of dream recall and various personality and cognitive variables casts doubt on the notion of any process of denial or self-censorship being involved in dream forgetting (D. Cohen, 1979; D. Cohen & Wolfe, 1973; Goodenough, 1991).

In an overall assessment of Freudian claims about the dream-work, based on studies by a wide range of researchers, two psychologists doubted its existence. Numerous studies of dream content outside a clinical setting found more information about the dreamers' lives and personal concerns than would be expected if the dream-work disguises the underlying wishes (S. Fisher & Greenberg, 1977, chap. 2). Put another way, the emphasis on the disguise function of the dream-work leads to the expectation that most, if not all dream content, is *not* continuous with waking thoughts. Recalling the findings from quantitative studies of lab and nonlab dream reports in chapters 3 and 4, virtually every finding about dream content can be understood as a refutation of Freudian theory.

Within the context of the emphasis on the dream-work, claims about emotions in dreams become of interest as well. On the one hand, Freud (1900, pp. 304, 305) thought that sleep itself may dampen emotions, but he did not think this dampening could be the "whole story." He further conjectured the dream-work "often mutes the tonality" of the emotions as well. In terms of assessing Freudian dream theory, however, the most important point is that Freud (1900, p. 299) concluded "there are plenty of dreams" in which an "intense expression of affect will make its appearance

accompanying a content that does not seem to offer any occasion for the release of affect." In these instances, the dream-work has transformed the contents but the emotions remain unaltered. Contrary to this conclusion, the general findings since the 1960s suggest the relatively few emotions in dream reports are consistent with dream content when they do occur. This is best shown in the lab study focused solely on emotions in dreams (Foulkes et al., 1988). On the basis of judgments by each dreamer and assessments by independent judges, the study, as generally summarized in a theoretically oriented book, concluded that the emotions in dream reports are "overwhelmingly appropriate to the dream content" (Foulkes, 1999, p. 68).

The Inadequacies of Empirical Studies Attempting to Support Freudian Dream Theory

In earlier decades, the most consistent defense of Freud's ideas about the role of symbolism in dreams was based on evidence from studies using subliminal stimulation, which were already discussed and rejected in chapter 5 (e.g., C. Fisher, 1954). In the case of later studies by psychoanalysts, they often relied on the production of waking mental images and free associations provided to them by participants after laboratory awakenings from both REM and NREM sleep, so they have nothing directly to do with dreams (Shevrin, 1996, 2003; Slipp, 2000). And as Shevrin and Eiser (2000, p. 1006) state, these studies do not "establish the disguising function" of dreams, which is central to Freudian dream theory.

Building on the past studies by psychoanalysts, a Freudian-oriented research psychologist carried out a series of independent subliminal studies using updated methodologies, which presented new evidence for unconscious processes influencing thought through the presentation of psychodynamically relevant stimuli (Erdelyi, 1985, 1996). However, non-Freudian experimental psychologists familiar with the subliminal literature remained highly critical of Freudian studies on methodological grounds (Fudin, 2006; Kihlstrom, 2004, p. 97). These conclusions have been reinforced by neuroimaging findings. These studies demonstrate, to use the same useful summary quotation cited in chapter 5, that subliminal stimuli can register in the visual cortex but they do not have any impact on thinking, however small, unless they are "further processed by cognitive control

networks underlying working memory" (LeDoux, 2019, p. 272). Therefore, researchers would have to demonstrate the subliminal stimuli shown to participants have registered in memory networks.

The main proponent of Freudian dream theory in more recent decades, Mark Solms (1997, 2002), who recast the theory as one of "neuro-psychoanalysis," believes there is support for Freud's wish fulfillment hypothesis. It is based on the alleged involvement of dopamine in REM sleep as its primary neurochemical. This is because dopamine is supportive of the "appetitive interests," which he believes are akin to Freud's concept of the libido (Solms, 2000, 2002; Solms & Turnbull, 2002, pp. 116, 312). However, the highly complex neurochemistry of REM sleep primarily involves cholinergic, glutamatergic, and GABAergic neurons (Boucetta, Cisse, Mainville, Morales, & Jones, 2014), with the role of dopamine still uncertain at best, and perhaps nonexistent (J. Siegel, 2017a, pp. 9–10, 12).

Based on his own studies of the effects of lobotomies and antipsychotic drugs on the ventral medial region in the prefrontal cortex (through which the dopamine reward system links the basal forebrain and the prefrontal cortex), as well as his analysis of the literature on antipsychotic drugs, this proponent of Freudian theory further concluded that "the functional anatomy of dreaming is almost identical to that of schizophrenic psychosis" (Solms & Turnbull, 2002, p. 213). However, as discussed in chapter 1, there is strong neuroimaging evidence showing the neural substrate supporting dreaming is not similar to those underlying hallucinations in psychotic patients (P. Allen et al., 2012; Ford et al., 2009; Waters et al., 2016).

With the exception of the usual case studies psychoanalysts and clinical psychologists have been producing for over 100 years, which continue to be problematic for testing the theory for a variety of methodological reasons, there are essentially no studies supporting Freudian dream theory at the neurocognitive, developmental, or content levels (Domhoff, 2003, pp. 136–143; S. Fisher & Greenberg, 1977; Mazzoni & Loftus, 1998; Mazzoni et al., 1999). More recently, due to the meager findings on symbolism in systematic studies of dream content, the theory faces new challenges because of its emphasis on symbolism (Freud, 1916, chap. 10; 1933, pp. 22–26). The emphasis on symbolism is also doubtful because neuroimaging studies have discovered several of the brain areas needed to generate symbolism are relatively deactivated during dreaming, as discussed in chapter 5.

The Activation-Synthesis Theory of Dreaming

Activation-synthesis theory claims the brainstem has a major role in generating dreaming and shaping dream content; cognitive processes are a secondary issue at best. The theory asserts that dreaming is initiated by putatively random and chaotic firings, which arise from the brainstem during REM sleep. Dreaming is a cortical attempt to make sense of these brainstem events, which extend to the occipital lobe as well (Hobson, 2000; Hobson, Pace-Schott, & Stickgold, 2000a, 2000b). As a result, activation-synthesis theory focuses on seemingly unusual features said to be unique to dreaming. They include such events as frequent occurrences of flying under one's own power. More specifically, the theory states "the individual historical components of dream plot construction" are "diluted" by "chaotic cerebral activation processes," which lead to "visuomotor hallucinations, delusional beliefs, thought impairments, emotional storms, and memory defects" (Hobson & Kahn, 2007, p. 857). Dreams are said to be "making the best of a bad job in producing even partially coherent dream imagery from the relatively noisy signals sent up to it from the brainstem" (Hobson & McCarley, 1977, p. 1347).

More generally, dreaming is said to be a hallucinatory and delusional state, which has the same formal structure as a psychosis: "psychosis is, by definition, a mental state characterized by hallucinations and/or delusions." Dreaming is therefore "as psychotic a state as we ever experience while awake" (Hobson, 2002, pp. 98–99). It is a form of "delirium," which is characterized by disorientation, visual hallucinations, illogical thinking, loss of recent memory, and confabulation (i.e., fabricating explanations and stories without the intention to deceive) (Hobson, 2002, pp. 23, 98–106). This suggests that it is "at least possible that dream content is as much dross as gold, as much cognitive trash as treasure, and as much informational noise as a signal of something" (Hobson, 2002, p. 101). However, as discussed in chapter 2, neuroimaging studies show hallucinations and dreaming are supported by different neural substrates (Ford et al., 2009; Hoffman & Hampson, 2012; Waters et al., 2016; Zmigrod, Garrison, Carr, & Simons, 2016).

The idea of dreaming as similar to psychosis leads to the claim that dream content cannot be studied scientifically. An approach that "begins with dream content" is "fraught with conceptual, methodological, and analytic

problems." This assumption leads to the conclusion it is better to start with the "details of brain physiology of REM sleep in animals" and then make "inferences back up to the psychological level (of dreaming) in humans" (Hobson, 1988, pp. 157–158). However, this conclusion is contradicted by cross-national and cross-cultural differences, by replicated findings on the handful of gender differences, and by the wide individual differences in what people dream about. The findings on consistency in dream content over decades and the continuity of dream content with waking thoughts about people and avocations also refute this assertion.

The Putative Brainstem Basis for Dreaming

Activation-synthesis theory originally began by locating the origins of REM periods in giant neurons in the pontine gigantocellular tegmental field (Hobson & McCarley, 1977; Hobson, McCarley, & Wyzinski, 1975). It further claimed that the neurochemical initiation of the periodic episodes of REM sleep is cholinergic in nature (in the form of acetylcholine). Finally, it concluded that neurons in the locus coeruleus are responsible for ending episodes of REM sleep (Hobson, Lydic, & Baghdoyan, 1986, pp. 378–379; Hobson & McCarley, 1977). Although the fact is not often remarked upon in the literature focused exclusively on dreaming and dream content, all of these claims were refuted within the space of a few years by those sleep researchers and physiologists who specialize in the study of REM sleep.

Experimental lesion studies soon showed the activation of the giant cells in the pons was not specific to REM sleep. Instead, these neurons are related to movement, as indicated by their very high levels of activity in waking. Activation-synthesis theorists missed this relationship because they used a head restraint while making their recordings (J. Siegel & McGinty, 1977; J. Siegel, McGinty, & Breedlove, 1977). Nor did the destruction of the entire gigantocellular tegmental region have any effect on REM sleep (Drucker-Colin & Pedrazo, 1981; Friedman & Jones, 1984a, 1984b; B. E. Jones, 1979; Sakai, Petitjean, & Jouvet, 1976; Sastre, Sakai, & Jouvet, 1981; Vertes, 1977, 1979). Moreover, "histochemical and pharmacological data" showed the neurochemistry of REM was not cholinergic in nature (B. E. Jones, 1986, p. 410). Still another surgical lesion study demonstrated the neurons in the locus coeruleus do not play any essential role in the cyclic appearance of REM and NREM sleep (B. E. Jones, Harper, & Halaris, 1977). The new evidence was succinctly synthesized as follows: "*The lateral pons is the brain*

region critical for REM sleep. Medial pontine regions, including the gigantocellular tegmental field neurons, are not critical for REM sleep generation . . . the neurons whose interaction is critical for REM sleep constitute only a small percentage of the cells within the lateral pontine region" (J. Siegel & McGinty, 1986, p. 421; emphasis in the original).

Physiologist Barbara E. Jones (2000, p. 956) later concluded that she did "not know of any physiological evidence that the cortex has no control over the brainstem or over the central activity of dreams." She added, "corticofugal outputs reach the entire brainstem as well as the spinal cord, influencing the very neurons shown to be critical for the initiation and maintenance of REM sleep in the pontine reticular formation." Subsequent evidence confirmed the large degree of forebrain control of the REM generator, especially through the hypothalamus (Luppi, Clement, & Fort, 2013). The highly complex nature of this system was demonstrated in a study briefly mentioned in the discussion of Freudian dream theory. Using new methods of histochemical neuronal identification, it discovered cholinergic, glutamatergic, and GABAergic types of neurons are active in varying degrees within three functional subgroups in the part of the brainstem involved in the production of REM sleep. In addition, many cells previously thought to be cholinergic because of their discharge activity were found to be either GABAergic or glutamatergic through definitive histochemical identification (Boucetta et al., 2014). The sole emphasis on the cholinergic neurotransmitter acetylcholine in activation-synthesis theory thereby proved once again to be misguided.

One of the two co-creators of activation-synthesis theory later conceded "the apparent REM discharge selectivity of the large paramedian reticular cells was a function of the head restraint required to allow long-term recording." He also agreed that "the original attribution of cholinergic neuromodulation to the REM-on cells of the pontine reticular formation was incorrect" (Hobson, 2007, p. 75). However, even though some alterations were made in the neural foundations of their theory, activation-synthesis theorists continued to claim that dreaming is hallucinatory and delusional, and contains highly unusual content (Hobson, 2007; Hobson & Kahn, 2007, p. 857).

The Rejection of Developmental Studies of Dreaming

As activation-synthesis theorists fully recognized around the turn of the century, every aspect of their theory is challenged by the longitudinal and

cross-sectional laboratory studies of children (Foulkes, 1982; Foulkes et al., 1990). In response, they asserted they could imagine dreaming even in neonates: "Similarly, we specifically suggest that the human neonate, spending as it does more than 50% of its time in REM sleep, is having indescribable but nevertheless real oneiric experiences. . . . For us, it is not at all difficult to imagine that an infant might be experiencing hallucinosis, emotions, and fictive kinesthetic sensations during REM sleep" (Hobson et al., 2000b, p. 803). This claim ignores the likelihood that dreaming depends upon the same cognitive capacities (concept formation, mental imagery, narrative skills, imagination, and an autobiographical self) making daydreams and many other waking cognitive processes possible. None of the necessary cognitive capabilities, with the exception of the ability to create concepts, has been found to be very well developed until ages 5–8, as discussed in chapter 6.

The strong claims by the activation-synthesis theorists are based in part on their analysis of a word-of-mouth sample, which they gathered from friends and friends-of-friends in the Boston/Cape Cod area. It consisted of eight children ages 4–5 (three girls, five boys) and six children ages 8–10 (one girl, five boys) (Resnick, Stickgold, Rittenhouse, & Hobson, 1994, p. 32). The dream reports were collected on 13 consecutive days by the parents of the young participants. The collection period began with reports after spontaneous awakenings for five mornings. Then, for the next five nights, the children had to repeat, "'I will remember my dreams' three times out loud just before going to sleep" (Resnick et al., 1994, p. 33). The next morning, they were awakened 15 minutes before their usual time of waking. For those five mornings, "parents were explicitly instructed to elicit as much detail as possible by guiding their children through the *who*, *what*, *when*, *where*, *why* questions and thereafter to base their questions on the children's reports" (Resnick et al., 1994, p. 33; emphasis in the original). However, the parents were also "reminded that it was important not to ask leading questions and to wait until the child finished a statement before asking another question."

In the final phase, the morning awakenings were supplemented through awakenings by the parents after three and five hours of sleep. These night awakenings led to very few dream reports. They were not included in the analysis because "in many of these attempts the parent was unable to rouse the child sufficiently to get any response and hence reflect a failure to

awaken rather than a failure to recall" (Resnick et al., 1994, p. 40). By assuming that the children could not be sufficiently awakened, the activation-synthesis theorists ignored the possibility that the children had no dreams to report, a possibility demonstrated by the low frequency of recall in the longitudinal and cross-sectional laboratory studies of dreaming in young children (Foulkes, 1982; Foulkes et al., 1990).

Based on this questionable set of procedures, dreams were reported after 85 of 131 morning awakenings (64.9%), which is well above the lab figures until ages 9–11 (Foulkes, 1982; Foulkes et al., 1990). The investigators then concluded the morning dream reports they collected revealed "remarkable similarities to those of adults in terms of length, number of characters and settings, and the presence of dream bizarreness" (Resnick et al., 1994, p. 43). Once again turning to the findings from the longitudinal and cross-sectional studies of children, which showed girls have higher rates of recall than boys, the results in the Boston/Cape Cod study are all the more unlikely because 10 of the 14 participants were boys (71.4%).

Numerous waking experimental studies of children, which examine the influence of the nature of the questions on children's responses, demonstrate the type of questioning used in the activation-synthesis theorists' study invariably leads to compliant answers, which add up to demand characteristics (Ceci, Bruck, & Battin, 2000; Foley, 2013; see Lamb, Hershkowitz, Orbach, & Esplin, 2008, pp. 50–57, for a summary). This is especially the case when the same questions are repeated. Thus, the likely confounds and strong demand characteristics raise doubts about the results, despite the warning to parents about asking leading questions. These doubts begin with the fact that the sample was in effect primed to please the investigators and the parents of the participants. The reasons for doubts also include the social persuasion and social pressure implied by repeated parental questioning. The implicit expectation they would do a good job of remembering and reporting their dreams was reinforced on five of the days by the admonition to improve their recall through the pre-sleep repetition of a vow to remember their dreams.

These findings were not replicated in the best-controlled nonlab study of children's dreams. It, too, used morning awakenings by parents but reported very different results (Sandor, Szakadát, Kertész, & Bódizs, 2015). The study was based on a six-week cross-sectional study of 19 boys and 21 girls, ages 3 to 8.5. Based on 1,680 awakenings, which were carried out over the space

of 42 mornings, the researchers first found a mean recall rate of only 21%. The even lower median recall rate was 15.5%. These figures are very similar to the results in the longitudinal and cross-sectional lab studies discussed in chapter 6. They are also similar to findings in the longitudinal studies in terms of their low frequencies of friendly and aggressive interactions (Sandor et al., 2015). The main differences occurred because the investigators had the parents ask several leading questions at the end of each of the morning interviews, such as "Did you see your dream as a motion picture or was it rather like a photo," and "Did you feel for example angry, sad, happy, surprised or scared or were you just calm?" (Sandor et al., 2015, pp. 11, 13). As noted in the previous paragraph, repeated questioning of this nature very often leads to the answers the children think the questioners want to hear from them.

Due to all the problems inherent in the Boston/Cape Cod study and the inability of independent researchers to replicate it, the conclusions drawn by the activation-synthesis theorists are not credible.

Bizarreness in Large Group Samples of Dream Reports

Activation-synthesis theorists focus on the alleged unusual features of dream content, such as sudden scene shifts and a purported sense of constant movement. Along with many other aspects of dream content, unusual features and sudden scene shifts are classified by activation-synthesis theorists as "bizarre" (Hobson & Kahn, 2007, p. 857). However, the other cofounder of the theory had found very few of the elements in dream content considered to be bizarre by activation-synthesis theory fully 25 years earlier (McCarley & Hoffman, 1981). As recounted in chapter 5, his coauthored study was based on 104 REM dream reports, obtained from a University of Cincinnati sleep-dream lab. Readers may recall that putatively bizarre instances, such as the sudden appearance or disappearance of a character, occurred in only 2.9% of the dream reports, and abrupt shifts in time in even fewer, 1%. There were no sudden appearances or disappearances of any objects. Flying under one's own power occurred in only 2% of the dream reports, and unusual environmental combinations were found in 17.3% (McCarley & Hoffman, 1981, pp. 904, 908, and figs. 4 and 6).

From the outset, the alleged bizarre features in dreams were said to be the result of the episodic firings originating in the brainstem during REM periods, which are also called "phasic events" (Hobson & McCarley,

1977). However, in the 1960s and early 1970s, laboratory dream researchers already had tried and failed to link a range of phasic activities to dream content through immediate awakenings at the moment these signs appeared (Antrobus, Kondo, & Reinsel, 1995; Foulkes, 1985; Pivik, 1986, 1991; Reinsel, Antrobus, & Wollman, 1985). Despite the general consensus on the futility of the search for causal relationships between phasic events and dream content, which was largely abandoned by the 1980s, activation-synthesis theorists nonetheless continued to characterize the relationship between phasic events in REM and the nature of dream content as "weak but consistently positive" (Hobson et al., 2000b, p. 799). They also continued to assume that the putative "chaotic cerebral activation processes" during REM sleep led to "visuomotor hallucinations, delusional beliefs, thought impairments, emotional storms, and memory defects" (Hobson & Kahn, 2007, p. 857). They did so without carrying out any laboratory research on this alleged relationship.

The emphasis on sudden scene shifts in dream reports serves as the main empirical basis for these continuing assertions about alleged bizarreness in dreaming. However, the claims about scene shifts were shown to be incorrect in the early 1990s. As documented in chapter 2, in the section concerning brief episodes of dreaming during drifting waking thought, one lab-based study found that there were more scene shifts in a sample of waking reports (Reinsel et al., 1992, pp. 169–170, 173). Simply stated, the studies by the activation-synthesis theorists lack the necessary control group (drifting waking thought) for any assertions about sudden scene shifts in dreams to be taken seriously.

Based on these and other findings, one of the coauthors of the necessary daytime control study, which compared REM reports with samples of drifting waking thought, criticized activation-synthesis theorists for continuing to "attribute bizarre cognition to chaotic pontine activation despite the fact that no experiments have supported this association." He further noted that he and his coworkers had reported instances in which there were bizarre dream elements when "phasic activity is minimal" and other instances in which there is no unusual dream imagery when there is high phasic activity (Antrobus, 2000, pp. 905–906; Antrobus et al., 1995). As Antrobus (2000, pp. 905–906) concluded, activation-synthesis theorists' "assumptions about how the pons determines the features of dreaming are completely without empirical support."

Emotions in Dream Reports

The original statement of activation-synthesis theory did not put a strong emphasis on emotions. It frankly stated that the theory "cannot yet account for the emotional aspects of the dream experience, but we assume they are produced by the activation of brain regions subserving affect in parallel with the activation of the better-known sensorimotor pathways." Further, these brain regions are "considered to be a part of the forebrain," and "strong emotion may or may not be associated" with the "distinctive formal properties of the dream" (Hobson & McCarley, 1977, p. 1336). Since neuroimaging studies show that most of the brain regions subserving emotions are relatively deactivated during sleep, including REM sleep, the basic underlying assumption underlying the activation-synthesis theory of emotions during dreaming has been refuted.

This relative lack of emphasis on emotions in the original version of the theory was in effect supported in the study by one of its cofounders, who joined with a coworker to code 104 REM dream reports for emotions, which were obtained from the sleep-dream lab at the University of Cincinnati (McCarley & Hoffman, 1981). As readers may recall, this study found little evidence for emotions in dream reports, as already discussed in chapter 8, so its results can be briefly summarized here. Using their own coding categories for anxiety, anger, sadness, and joy/happiness, the researchers found that at best 38% of the dream reports included at least one instance of any emotion and that they were primarily negative (McCarley & Hoffman, 1981, p. 908, and fig. 3).

However, based on a nonlab study a little over a decade later, other activation-synthesis theorists claimed there was "underreporting" in that study (Merritt, Stickgold, Pace-Schott, Williams, & Hobson, 1994, p. 46). This conclusion concerning underreporting is based on a study of 200 dream reports, which one of the activation-synthesis theorists had collected from students in his course on The Biopsychology of Waking, Sleeping and Dreaming, sponsored by the Harvard Extension School. Students were asked to keep a dream diary "to encourage active participation" in the material of the course (Williams, Merritt, Rittenhouse, & Hobson, 1992, p. 173). Whenever a dream was recalled during their daily lives, the 12 student participants were asked to write a report of it on a standardized report form. After documenting their reports, the participants were instructed to self-code each report on a line-by-line basis. They did so through the use of

a list of eight emotion categories, which was included on the same sheet on which they wrote the dream report: anxiety/fear, anger, joy/elation, shame, sadness, surprise, and affection/eroticism. In addition, there was a category labeled "other." This open-ended category made it possible for participants to add any additional emotions they may have experienced.

These independently developed emotion categories are very similar to those in the Hall/Van de Castle (HVdC) coding system. However, the HVdC system includes shame in the Fear/Apprehension category, which is roughly the same as the "anxiety/fear" category in this study. In addition, the "joy/elation" category seems to parallel the HVdC category for Happiness/Joy, and the affection/eroticism category may partially overlap with Happiness/Joy. Surprise, as noted in chapters 3 and 8, was once part of the HVdC Confusion category but has subsequently been redefined as a cognitive category concerned with cognitive appraisals.

The 200 dream reports each contained 50 or more words. Emotions were found to be present in 95% of the reports (Merritt et al., 1994, pp. 46, 55). This figure is 2.5 times higher than what was found in the above study based on REM dream reports and coded by independent coders. However, this extremely high figure is very close to those reported in studies based on self-ratings by participants, as discussed in chapter 8 (Röver & Schredl, 2017; Schredl & Doll, 1998; Sikka et al., 2017; Sikka et al., 2014). Sixty-eight percent of the emotions were negative in the nonlab dreams from the 12 students, which is similar to what is found in most studies using independent coders or raters (Merritt et al., 1994, p. 56).

A third activation-synthesis study of emotions is based on a unique "lab/nonlab" setting. Each of the nine participants, seven women and two men, was studied individually over three consecutive nights in her or his own bedroom at home in Oslo. The lead researcher in the study, a native of Norway, sat in a nearby room, using a portable polysomnograph to monitor their sleep stages and carry out awakenings during REM periods (Fosse, Stickgold, & Hobson, 2001). The study thereby combined aspects of lab and nonlab studies, and very likely overcame any putative biases concerning emotions that might be present in one setting or the other. After awakenings, which resulted in a total of 88 REM dream reports overall, the participants were asked to write their accounts of their dreams on a standardized report form. After documenting their reports, the participants coded each report line-by-line for any emotions they could identify. These self-codings

were carried out on the basis of the same eight categories used in the above study (Fosse et al., 2001, p. 1).

Twenty-six percent of the reports in this study had no emotional elements, despite the immediacy of recall in a comfortable and familiar home setting (Fosse et al., 2001, pp. 1–2). The study also reported negative emotions were more prevalent than positive emotions in the majority of the dream reports (44% vs. 33%), with another 23% rated as neutral. Since the definition of positive emotions included affection/eroticism content, as well as "interest" and "motivation," and the definition of negative emotions was somewhat expanded as well, it is not possible to make exact comparisons with the HVdC findings (Fosse et al., 2001, pp. 2–3). However, even though this broadening of the number of categories leads to caution in assessing the *degree* to which negative emotions predominated in this study, the fact that this study broadened the categories of emotions makes the lack of any emotion in 26% of the dream reports all the more striking. It does not fit with the activation-synthesis theorists' nonlab study, based on the same list of emotions, nor with their post-1990 emphasis on the importance of emotions in dreams (Merritt et al., 1994).

Activation-synthesis theorists also carried out a fourth study of emotions. They rely on it exclusively in their later discussions of the theory (e.g., Hobson & Kahn, 2007). For this fourth study, the dream reports were collected in 1999 "as a graded class exercise" in the course on the Biopsychology of Waking, Sleeping and Dreaming at the Harvard Extension School. This requirement was included in order to "motivate students to comply with the complex instructions." However, the students were also reassured they "would be given a set of dream reports if they could not recall their own dreams." The mention of this alternative set of dream reports was meant "to discourage undesirable demand characteristics" (Kahn, Pace-Schott, & Hobson, 2002, p. 35). Thirty-five students provided 320 dream reports. Using the same coding categories that activation-synthesis theorists had been using since their 1994 study, the students self-coded their dream reports as including far more emotions than was the case in the activation-synthesis theorists' lab/nonlab study the year before (Fosse et al., 2001).

Somewhat more specifically, emotions were "almost always evoked" (Kahn et al., 2002, p. 34). In this study, however, the emotions self-codings were used in a more specific way. They were categorized in relation to the different types of characters appearing in the dream reports. In dream

reports including characters known to the dreamer, "feelings were reported 81.4% of the time," compared to 69.3% in dream reports with generic or unknown characters (Kahn et al., 2002, pp. 40–41). In this study, unlike past studies by activation-synthesis theorists, the most frequent emotions were positive ones, caring (18.2%) and joy (14.2%), "followed by anger (11.6%), and anxiety (9.7%)" (Kahn et al., 2002, p. 45).

The overall findings on emotions by activation-synthesis theorists are not useful for five reasons, the first three of which overlap to some extent. First, their own findings are not consistent over the four studies. Second, they ignore this inconsistency by not making use of their two studies reporting lower frequencies of emotions in dream reports (Fosse et al., 2001; McCarley & Hoffman, 1981).

Third, the two studies they foreground are based on dream reports collected from students as one of the requirements for a passing grade in a course taught by one or another activation-synthesis theorist. This one fact alone suggests there are strong demand characteristics built into their nonlab studies. Fourth, the extremely high percentages of dream reports with at least one emotion in the classroom-based studies are based on self-codings by the dreamers themselves, which usually lead to much higher frequencies of emotions than do studies using independent coders, as discussed in chapter 8. It is therefore extremely likely that the findings by the activation-synthesis theorists are compromised by a wake-state bias as well as by demand characteristics. Fifth, and finally, the neuroimaging evidence discussed in chapter 8, which shows that only one of the association networks involved in supporting waking emotions is activated at certain times during sleep, raises major doubts as to whether this truncated neural network can support the high percentage of emotions that activation-synthesis-theorists insist are an important dimension of dreaming.

For all these reasons, any claims about emotions in dreams by activation-synthesis theorists cannot be taken at face value.

Summarizing the Criticisms of Activation-Synthesis Theory

The neurophysiological underpinnings of activation-synthesis theory have been convincingly refuted by neurophysiologists, and in particular by those researchers who focus on REM sleep. The alleged effects of phasic events on dream content have been proven wrong by numerous studies by other dream researchers. Then, too, the activation-synthesis theorists' one study

of children proved to be inadequate on methodological grounds. The study of children was also called into question by contradictory findings in both lab and nonlab studies by other researchers. The activation-synthesis theorists' studies of adult dream content also have been met with skepticism on methodological grounds. These studies are directly challenged due to the ways in which they were conducted and also because better-controlled studies by other dream researchers led to different findings. To take the two most important examples, there is not as much bizarreness and emotion in dreams as activation-synthesis theorists claim.

Conclusions and Implications

Neither of the two well-known traditional comprehensive theories of dreams discussed in this chapter stands up well in the light of the wide range of empirical findings accumulated over several decades. Most, but not all, of their own studies have been criticized on methodological grounds as well. Moreover, Freudians have done studies casting doubt on some of the studies by other Freudians, and the activation-synthesis theorists have produced contradictory results on bizarreness and emotions, as well as other findings rejected by most dream researchers. There is no longer any reason to believe that either of these theories provides a sound basis for future theorizing. Nevertheless, some of the legacies of both theories are found in several of the adaptive theories of dreaming discussed in the next chapter.

The Neurocognitive Theory of Dreaming

The Where, How, When, What, and Why of Dreams

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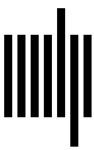

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