

J. ALLAN HOBSON, M.D.

EGO ERGO SUM:

TOWARD A PSYCHODYNAMIC NEUROLOGY

Abstract. Modern sleep and dream science not only fails to support the central tenets of Freudian dream theory but raises serious questions about other strongly held psychodynamic assumptions including the nature of the unconscious mind, infantile sexuality, the tripartite model of the mind, the concept of ego defense, free association and the analysis of the transference as a way of effecting adaptive change. This article summarizes a radical revision of psychodynamic theory in terms of the neurobiological findings of the last half century and proposes an alternative theoretical model which posits a virtual reality generator for the brain that arises late in evolution and early in the development of thermoregulating animals. The author's training and clinical experience are used to highlight these theoretical considerations and inform a forthcoming treatment-oriented book in progress entitled EGO DAMAGE AND REPAIR.

Keywords: REM sleep, dreaming, activation-synthesis, AIM model, protoconsciousness, virtual reality, free energy, hypnosis.

EGO ERGO SUM, the tentative title of my forthcoming book, is intended to suggest an alternative theory of human development and human identity to those of two predecessors, René Descartes and Sigmund Freud. My new protoconsciousness theory is designed to supersede Cartesian dualism, a philosophical error that derives from illusory subjective experience and perpetuates the religious assumption that the soul survives the death of the body. According to Descartes (1649/1989), the brain and the mind are two causally separate entities, two perfectly synchronized watches created and set in motion by God. I reject Cartesian dualism and suggest that brain and mind are two parts of an integrated system. My critique of Freud is both technical and philosophical. The focus, for the purposes of this article, is his dream theory (Freud, 1900). I based my original critique of Freud upon mechanistic and functional details that grew out of modern sleep science (Hobson & McCar-

ley, 1977; McCarley & Hobson, 1977), but I have recently come to the conclusion that Freud was an inadvertent Cartesian. Furthermore, I argue that the egregious errors of his dream theory impugn many other aspects of psychoanalytic theory so severely that revision is not enough. The outline of a radical revision is proposed in which the goal is to conceptualize a scientific psychology, which Freud envisaged in his unpublished *Project* of 1895 (Freud, 1895/1950a). In what follows, the reader will find a chapter by chapter summary of my book in which I relate several of the arguments to themes that were debated at the “Minding the Gap” meeting of the New York Psychoanalytic Society organized and moderated by Lois Oppenheim (May 5, 2012).

Introduction

The separation of neurology and psychiatry that occurred at the turn of the 20th century coincided exactly with Freud’s publication of *The Interpretation of Dreams* (1900/1950b). The result was an unfortunate split into the brainless mind of psychiatry and the mindless brain of neurology. This was nothing more or less than the institutionalization of Cartesian dualism, and I hold Freud responsible for this unfortunate split. Having failed to create an integrated theory, he developed a speculative psychology with no relationship to brain science.

I hold that the two medical specialties (neurology and psychiatry) need each other, at least conceptually, and indicate my appeal for a reintegration of these now disparate fields in *EGO ERGO SUM* with the subtitle *Toward a Psychodynamic Neurology*. By psychodynamic neurology, I mean to suggest that many phenomena, now referred to as psychodynamic, have a solid base in neurology. Chief among them is the brain basis of dreaming, the subject to which I have devoted my life’s work. *EGO ERGO SUM* is a preliminary clinical and philosophical superstructure built upon this solid scientific foundation.

Historical Background

Freud wanted to create a scientific psychology but failed to do so. His 1895 *Project* (Freud, 1895/1950a) was wisely abandoned because, at that time, not enough was known about the brain to make integration possible. Now, 120 years later, we can reexamine the neurological basis of so-called psychodynamics.

We now know the brain basis of dream genesis, dream bizarreness, and dream forgetting. We have good and neurologically sound explanations of dissociation, the mechanism that Charcot and Janet introduced to Freud with the fateful slogan: "Toujours la chose génitale" (Sex rules!). This idea set in motion the Freudian emphasis on sexuality at the expense of other theories. In addition to the Freudian theory of dreams, which I consider to be obsolete and entirely replaceable, the following Freudian concepts also need remedial attention: 1) the tripartite model of the mind, which I revise by emphasizing ego and demoting id; 2) the theory of the unconscious, which I revise with a theory of two states of consciousness; 3) the concept of infantile sexuality, which I reject as ill-founded; 4) the model of ego mechanism of defense, which I replace with the idea of ego tactical offense; and 5) the Freudian approach to psychopathology, which I reconstruct in neurobiological terms. Other psychoanalytic shibboleths, such as the Oedipus complex; the oral, anal, and genital phases of development; and the psychopathology of everyday life, are also called into question. These ideas, which are speculative, literary, and arbitrary, have no place in a truly scientific model of the mind.

A more serious, fundamental, and problematic critique is the crypto-Cartesianism that I attribute to Freud's abandonment of neurology. Although he maintained that at some future date the brain basis of psychology would be discovered, Freud persistently denied that any of his claims derived from or pertained to neurology. This claim is unwarranted, impossible, and untrue. The claim is unwarranted because the interpretation of dreams and all that followed it is rooted in Freud's erroneous and incomplete neuroscience. It is untrue and impossible because there can be no psychology that does not have a seamless connection with brain science. Freud's claim to the contrary notwithstanding, every psychological principle implies or invokes a neurobiological concomitant and vice versa. Worse yet, the denial of neurology leads to the unpardonable and intellectually impossible separation of mind and brain. This is the crypto-Cartesianism of which I speak critically. The mind does not operate on its own. It is not a separate entity from the brain. It has no set of laws that are all its own.

Instead of a separate discipline, I recommend one that recognizes the brain and the mind to be the objective (third person) and subjective (first person) domains of a unified system whose proper study is bijective mapping between the unified domains.

Instead of a problem, the coexistence of brain and mind provides priv-

ileged access to each part via the portal of the other, and the opportunity to gauge accuracy and plausibility of either, via the concordance of the data from both. It is the failure to find such concordance that prompts me to suggest that we start over. Noble efforts to fit new neurological data with the implausible and unwarranted theories of Freud, spearheaded by Mark Solms and his friends, are—in my opinion—futile attempts to prove that Freud was after all right. I say that he was wrong and that his work needs to be placed in modest historical perspective.

The absence of open acknowledgement of the many ways in which Freud was wrong is in keeping with the politically conservative effort to protect psychoanalysis from further discredit, but it prevents the useful method of introspection from playing a dignified and salient role in cognitive neuroscience. It is time for psychoanalysis to recognize that Freud was an ingenious speculative philosopher who naturally made mistakes. If he had been judged by scientific standards, he would have been refused credibility in the first place and, even if he were rigorously scientific, his quaint theories would long since have been abandoned. We all wish that the mind was as easy to study as Freud supposed, but we must now acknowledge that the mind is marvelously complex and that it cannot be studied without the help of neuroscience.

The suggestion that Freud created a new science, with its own set of rules, is blatantly preposterous and grandiosely pretentious. Arguments of this type lead critics to assume that psychoanalysis is more religious than scientific; not even the retreat into the humanities can dispel this fear. To correct these trends, psychoanalysis must take part in the neurobiological training of young people who might be capable of bridging the gap between mind and brain, a gap that is now narrowing and thereby offering real opportunities for theoretical and practical reform.

Neurological Development

Freud cannot be blamed for his ignorance of sleep psychophysiology because its most salient principles followed the discovery of REM sleep in 1953 (Aserinsky & Kleitman, 1953), long after Freud died. The failure to observe and experiment is nonetheless an important limitation of psychoanalysis, in which the tendency is to interpret first, and seek corroborative evidence second. A similar oversight is the failure to study the brain at all except as a retrofit of new observations drawn from old theories. Thus it is fair to point out that psychoanalysis never pretended to

collect dream reports, to observe people and animals sleeping, or to ask the simplest of questions, such as: Does the character of dreaming change as a function of psychoanalytic treatment in individual cases? The necessary age-matched control group is easily obtained and would constitute a welcome contribution to the literature, because it has been noted that dreams do change with age. As far as I know, such a study has never been performed. Other relevant science includes the now extensive literature on the basic NREM-REM sleep cycle showing that dreaming, instead of occurring in the instant before awakening, as Freud erroneously assumed, is common at sleep onset, in REM and in NREM sleep, especially as sleep lightens over the course of the night.

The dreaming that accompanies about half of sleep varies widely, depending upon the physiology of the sleep with which it is associated. At sleep onset, the dreams are likely to be fleeting. In NREM sleep, the dreaming is likely to be thought-like. In REM sleep, the dreaming is likely to be hallucinatory, bizarre, and sustained. In other words, a dream is not just a dream, no matter what its provenance is, and, of course, no report is really a dream; it is always just a report. Sensitivity to these caveats has been blurred by the psychoanalytic conviction that only by its own arbitrary methods could any dream be properly understood, and that all dreams can be interpreted via the technique of free association.

Thus, important phenomenological distinctions were not made by psychoanalysis, which tended, erroneously, to regard all dreaming as the same. The quaint Freudian idea that all dreams express wishes was invalidated by the sometimes abhorrent themes and by the predominance of negative affect in many dreams, as Freud recognized, but did not adequately address, in his 1933 revision paper (Freud, 1933/1990). Also overthrown by modern sleep and dream science was the Freudian construct of the day residue, which was said to pair up with the unrepressed infantile wish in dream genesis. When an experiential source of dream content could be identified at all (and often none could be found), the peak occurrence was six days before the dream, not the day of the dream. This is a low-tech experiment that could have been done in 1895. Freud's ideas, which persist despite the absence of evidence, include the conviction that waking and dreaming are continuous, implying that dreaming is a reaction to daytime experience rather than a preparation for tomorrow, often with little or no relation to yesterday.

A more positive note was the surprising discovery that REM sleep was present in all mammals and birds, but absent from submammalian and

subavian species. This gave the dream science program a precious animal model. Whether or not nonhuman animals dreamt, their REM could be investigated using sophisticated neurobiological techniques. Psychoanalysts could not have been expected to make this discovery, but they might have wondered how exclusive human dreaming really was. Self-styled biologists, like Freud himself, might have guessed that dreaming was part of a much larger picture of adaptation than merely shielding consciousness from disrupting infantile sexual wishes. This biological avenue led to the activation-synthesis hypothesis, advanced in 1977 (Hobson & McCarley, 1977), which provided the first brain-based alternative to Freudian dream theory. According to activation synthesis, dreams were caused by brain activation in sleep, not by repressed infantile wishes. They were bizarre because of the chaotic nature of the activation process, not because of a need to protect consciousness via disguise and censorship. They were forgotten because of deactivation of the memory system, not because of a need to repress the forbidden memories.

As for dream meaning, activation synthesis emphasized the revelatory nature, rather than the concealment hypothesized by Freud. Dreams were therefore alleged to be best understood when examined directly, not via an interpretation scheme involving free association. The Freudian distinction between manifest and latent dream content was thus questioned. Activation-synthesis evoked a storm of protest from psychoanalysis and debate about the many theoretical differences persists until today. The latest objection to activation synthesis comes from Mark Solms, whose neuropsychological work has suggested that forebrain structures, such as the parietal operculum and deep frontal white matter, are essential to dreaming (or at least to dream recall).

Solms now asserts that the functional significance of dreaming is as guardian of sleep. Freud asserted that subjects would wake up if they did not dream. This theory is vulnerable to attack on three counts: (1) no psychological process can exert physiological effect because awareness itself is not causal; (2) sleep continuity is physiologically determined; and (3) brain lesion evidence is not sufficient to support the hypothesis.

Activation synthesis has two important advances to bring to this debate. The first is the AIM model, which adds two important elements to the activation (Factor A) story. One is input-output blockade of REM (Factor I) and the other is chemical modulation (Factor M). Factor I is responsible for the continuity of sleep in REM and Factor M results in dream forgetting and dream bizarreness. According to AIM, Factor M,

REM sleep is cholinergically modulated and aminergically demodulated. Waking is the opposite. Waking and dreaming are seen as two different, but cooperative, states of consciousness.

Together, Factors I and M explain the phenomenological differences between waking and dreaming, both of which are brain-activated states of consciousness. The second advance is functional: instead of the guardian of sleep idea put forward by Freud and now supported by Solms (1997), protoconsciousness theory regards the function of REM to be the positive interaction between the shared brain systems of REM and of waking. Sleep is its own guardian. Dreaming could not and does not have this function. Dreaming is our subjective awareness of a functionally crucial interaction. Dreaming is certainly psychologically meaningful, but its meaning is not at all as imagined by Freud and it has no functional role in the preservation of sleep.

The other major advance of scientific dream research is its developmental aspect. In contrast to the evolutionary story, which showed REM to be correlated with high levels of brain development (mammals and birds), REM sleep is most abundant in the early life of those mammalian and avian species that evince it. REM occupies eight full hours per day in human infancy and the time devoted to REM is even greater in the third trimester of pregnancy. This fact indicates that REM sleep is functionally significant in the growth and development of the brain in the phylogenetically most advanced animals. Such an idea immediately suggests a function in the evolution of consciousness itself, whose highest form is found in man, the only animal that surely dreams. An idea to which I return again and again in my new book is that REM sleep, with its dreams, is a virtual reality program for the conscious brain-mind, and it is consciousness—not the maintenance of sleep—which is the function for which REM was evolved.

Freud's central theory of the dynamically repressed unconscious is strongly challenged. This radical shift in theory has implications for the whole corpus of psychoanalytic theory, not just the interpretation of dreams. In *EGO ERGO SUM*, I suggest across-the-board changes in the way we suppose that the mind is constructed, maintained, and becomes dysfunctional. A key empirical stimulus to this theoretical revolution is the surprising result of Rechtschaffen, Bergmann, Everson, Kushida, and Gilliland's (1989) sleep deprivation studies. Although there is a wide margin of safety, after three to four weeks all sleep-deprived animals lose the ability to control dietary and thermal calories. All sleep-deprived animals

die of starvation in the presence of limitless food supply and with a wildly fluctuating body temperature. Because mammals and birds are the only animals that regulate body temperature, it is striking to note that they are also the only animals that have REM sleep.

The regulation of body temperature is crucial to higher brain function and hence to consciousness. REM is clearly of critical significance, not only to dreaming but to the most fundamental physiological housekeeping functions. I explain in detail the implications of these striking facts when I examine their strong implications for brain function. It is for all these cogent reasons that modern sleep and dream science forces us to replace psychoanalytic theory, not just revise it.

Instincts and Emotions

Freud emphasized instinct in keeping with his Darwinian self-description. But he took a very provincial Viennese position when it came to what he considered to be instinctual: many critics thought that he overemphasized sexuality, and modern sleep and dream science explains the erroneous assumptions that he made about infantile sexuality. Freud also misunderstood and ignored Darwin's emphasis on the emotions as serviceable habits that were adaptive and not necessarily symptomatic.

In my recasting of emotion theory, I treat emotions as instincts with an important neurocognitive function. Sexuality is an instinct, but it shapes early development much less strongly than Freud supposed. Emotions—especially the predominant dream emotions of anxiety, elation, and anger—are viewed as adaptive instincts rather than as symptoms indicative of a failure to effect compromise between unconscious and conscious compartments of the mind.

In addition to the strong empirical evidence that comes from systematic laboratory research, the evidence of attachment and separation studies in human ethology are incorporated into the new developmental picture (Bowlby, 1988). The net result is a shift away from the idea of a dynamically repressed unconscious as the most significant shaper of mentation, to a more broadly biological and behavioristic model that views development as a result of the interplay between epigenetic internal forces (instincts) and the psychosocial surround (environment).

The demotion of sexuality results from a more sophisticated view of infantile behavior, especially the sleep behavior of the newborn. The human infant sleeps 16 hours a day and, as already noted, 8 of those hours

are devoted to REM. In REM sleep, the infant reveals a host of facial expressions indicating that the three emotions listed above (anxiety, elation, and anger) are activated, as if in anticipation of their use in waking, including infantile waking. At the same time, erection in males and clitoral engorgement in females is evidence of peripheral, but not central, sexual readiness. The idea is that the infant is readying him or herself for sexual experiences that will prove useful in the future; however, this cannot be construed as evidence for central sexual arousal in any mental sense of the word. Peripheral phenomena, like erection, do not cause central excitation because the sensory input from the outside world, including the body, is actively inhibited during REM. Another empirical fact of relevance is the relative rarity of erotic experience in adult dreams (although erection continues to be an inverse peripheral sign of REM).

The emotional facial expression of infants during REM is, as Darwin insisted, communicative evidence of central emotional activation. Facial expression is a reliable way to alert others about our state; conspecifics (organisms belonging to the same species) are welcomed (by smiling) or warded off (by grimacing). Anxiety is a signal, too, but a signal to the self, not the other. It is a warning signal and a very useful one. One should be anxious when walking alone on a dark street; survival may depend on it. Likewise, and more subtly, anxiety is useful when it prompts checking for the presence of keys, identity documents, suitability of dress, proper information about location—including addresses, directions, and other orientation data. Efficiency of waking behavior depends upon those habits, which we iterate when anxious in dreams. None of these details is likely to be symbolic. Rather they are what they appear to be: practice for waking. The fact that dream bizarreness is compounded of microscopic disorientation, not monsters or surrealistic imagery, is evidence for this common sense, adaptational viewpoint.

The Psychodynamic Ego

In elaborating the central thesis of my new theory, I question the tripartite theory of the mind and suggest replacing it with an EGO-only model. According to modern sleep and dream science, ego development begins in utero and continues throughout life. If there is no—or very little—infantile sexuality (and therefore little or no infantile sexual wishes to forbid and repress), what is left of the id? Surely not emotion, which we now rightly regard as an adaptive necessity, not a symptomatic nuisance.

Psychoanalysts like to suppose that the subcortical structures of the brainstem and limbic lobe constitute the id, but this strikes me as dubious because those structures, albeit unconscious and instinctual, are only primitive in the senses of priority and fundamental in ontogeny. Furthermore, they are positive and essential building blocks of consciousness, not its hostile invaders.

Subcortical brain structures are, therefore, by no means bad or even necessarily problematic. Instead they are automatic (hence reliable) and crucially useful because they provide the developing brain with the virtual reality primordia of self, space, movement, and emotion. These are all conflict-free functions, of use to the emerging ego. I therefore suggest eliminating the construct of an id and referring to the mental apparatus as ego from a very early stage of development through to maturity and beyond. The so-called superego can be considered that part of the ego that deals with learned social constraints. It is not necessarily in conflict with the ego, even if there is always some competition between self and other and between instinct and social restraint. The cortex may well be the site of social learning and of self-discipline, but it is also the site of abstract cognition, which I call secondary consciousness.

Instead of an id, ego, and superego (which are constantly at war with each other) and an unconscious mind (which is hostile to consciousness), I propose an ego composed of primary and secondary forms of consciousness that positively interact, each to the other's benefit. Dreaming is our subjective experience of primary consciousness. It is intensely vivid as long as it lasts. Hence it is a conscious mental state. In this view, dreaming is not so much unconscious as it is difficult to remember when we are awake. At maturity, secondary consciousness is added to the mix and waking is compounded positively of the two kinds of consciousness. Primary consciousness provides the brain mind with the basics of cognition: a self, a spatial arena, a means for sensing that arena and moving in it, and a means for assessing the interactive climate of that arena. All of these innate skills are genetically and epigenetically determined in all mammals and birds. They are the primordia of consciousness postulated by Immanuel Kant (1781/1999), denied by John Locke (1690/2009), and overlooked by Sigmund Freud. Eliminating the id and the dynamically repressed unconscious from our theory of the mind, as you can see by now, changes everything. Secondary consciousness is in the service of abstract cognition: symbolization, language, numbers, mathematics, literature, self-reflective awareness, and awareness of awareness are its

fruits. Secondary consciousness is much more prominent in waking, and much more highly developed in primates than in all other classes of animal. Secondary consciousness reaches its highest form in humans.

Primary and secondary consciousness mechanisms interact dynamically in manifold ways, which can now be specified. The neurological basis of dissociation, condensation, depersonalization, and displacement (to name a few supposedly psychological processes) can now be accounted for at the level of the brain. These are the very phenomena that baffled Charcot and Janet, and the phenomena that sent Freud back to Vienna to split the mind and the brain in two. The reintegration is what I mean by psychodynamic neurology, and it is this integration that I hold to be now both possible and desirable.

Psychopathology

Instead of the conflict and compromise that Freud used in constructing his theory of psychopathology (including the questionable idea of universal neurosis), I build a model of innate duplicity with primary and secondary consciousness mechanisms specified in neurological terms and working cooperatively together to create the normal mental states of waking, NREM sleep and REM sleep. The new model bears some similarity to Freud's concept of primary and secondary process, but places the emphasis on design error and functional imbalance, rather than intrinsic conflict between instinctual and social forces. The advantages of the new primary-secondary consciousness schema is that the anatomical, physiological, and dynamic interactional substrates of primary and secondary consciousness can be specified and used to explain clinical syndromes.

With respect to dynamic tension between the subcortical primary consciousness structures, in which activation engenders dreaming and the secondary consciousness of waking via the cortex, my new model admits to the dangers that Freud, Jung (1957), Kant, and others noticed. Dreaming does evince the two key definers of psychosis: hallucinations and delusions. I have gone so far as to suggest that dreaming *is* an organic psychosis, by definition. Not only is normal dreaming characterized by hallucinations and delusions, but its bizarreness illustrates numerous cognitive abnormalities of the sort that are seen in mental illness. The amnesia for dreams is an excellent model for memory loss that is associ-

ated with brain dysfunction, not the motivated forgetting advanced by Freudians.

The model is therefore most useful in explaining the psychoses, which are major clinical problems of psychiatry. Of the three kinds of psychosis, my model is best in accounting for the organic psychoses, useful in helping to understand and treat affective disorders, and helpful in understanding the secondary symptoms of schizophrenia. It defers to future advances in biological science, particularly genetics, for an explanation of the primary symptoms of schizophrenia. In this important respect, psychodynamic neurology lays down its arms. It may be helpful to schizophrenic patients for understanding the mechanism of their symptoms and for reducing the symptoms' intensity with drugs, but I freely admit that I do not yet know how to make the primary symptoms of schizophrenia go away.

By combining recognition of the genetic and epigenetic mechanisms of sleep and dreaming with basic learning theory, the new model affords a promising beginning in the study of character development and the genesis of psychoneurosis. The theory points the way toward new modes of thinking about these conditions, which have proved so obdurate, despite the popularity of psychoanalysis. Human subjects experience a wide range of states of waking and problems in living that cannot be easily reduced to any simple formulation. The psychopathology of everyday life is seen in a neurocognitive rather than psychoanalytic light. The famous Freudian slips are certainly evidence of unconscious brain computational errors, but do not constitute evidence of motivated impulsiveness.

A major shift in emphasis derives from the new way of looking at emotion as natural and given, rather than only contrived in reaction to environmental stress. Learning to cope via self-acceptance and support are more realistic ways of responding to all psychiatric complaints than applying a speculative and outmoded analytic psychology to them. Coping includes the judicious use of medication, but cautions against over reliance on the good, but still imperfect, chemicals offered by the drug companies. An organic orientation is not incompatible with a psychodynamic approach, especially if the psychodynamic mechanism in question is itself organic. Mind-brain integration is the main goal of my book and should be the main goal of enlightened psychiatric treatment. Mind and brain are a unified system and it is impossible to understand one without understanding the other.

Lucid Dreaming

Perhaps the most convincing evidence for the validity of protoconsciousness theory comes from the laboratory study of lucid dreaming (LaBerge, 1990). When a dreamer becomes lucid, he or she gains insight into the fact that he or she is dreaming and not awake, as he had previously believed. From the phenomenology alone, it is thus clear that lucid dreaming is a hybrid state, evincing qualities of both waking and dreaming; hence the simultaneous but split manifestations of primary consciousness working alone (dreaming) and working together with secondary consciousness (waking). Lucid dreamers should thus manifest the neurology of both states, and they do.

Using quantitative EEG techniques, Ursula Voss of Frankfurt, Germany, and colleagues have been able to show that although most manifestations of REM sleep persist, the lucid subject activates the EEG to a midpoint between REM and waking (Voss, Holzmann, Tuin, & Hobson, 2009). It is significant that this EEG activation is predominantly frontal, in keeping with the insight that the person is dreaming and with the ability of lucid dreamers to execute voluntary eye movements to indicate to the experimenter that they are lucid! This *experimentum crucium* clearly indicates that the frontal lobe—long known to be the site of executive ego function—can, when sufficiently activated, support insight as to one's true condition. This finding alone is of earth-shaking significance for general theory and for psychotherapy. Insight is a frontal lobe function. Lucidity may arise spontaneously, but it can be enhanced by presleep autosuggestion. It is therefore possible to change the state of the brain and with it, the state of the mind, by conscious manipulation. This is nothing more or less than the power of positive thinking. Its discovery is a breakthrough for psychodynamic neurology.

Because presleep autosuggestion is a form of self-hypnosis, these experiments also show how wrong Freud was to insist that his technique was not related to hypnosis. Psychoanalysis is hypnotic, despite Freud's injunction to the contrary and its efficacy, if any, is very likely to be the result of suggestion and not of free association—still another unlikely, if not impossible, technical proposition. The interpretation of dreams may also be a form of self-hypnosis with no curative power of its own. In any case, the study of lucid dreaming shows clearly that positive thinking is efficacious and thus a solid cornerstone of what has been called cognitive-behavior therapy.

Altered States

Lucid dreaming may be the altered state par excellence when it comes to effecting change in the brain by behavioral means, but there is a spectrum of states, many of which have features in common with dream lucidity. This suggests that a general theory may be emerging that ties them all together. Chief among them is hypnosis itself, and hypnosis—although it is yet to be fully understood in terms of brain science—is a powerful component of lucid dreaming. Its very name is already suggestive of a kinship with sleep and it is clear that hypnotic trance induction produces a relaxed state of brain and mind with the strong possibility of sleep onset Stage I, in which microdreams may occur. The amnesia of post-hypnotic suggestion remains to be explained, but it seems possible that cooperative subjects may be able to enter states at the wake-sleep boundary that tap into psychodynamic neurology in ways that we may now investigate, using the concepts and principles of modern sleep and dream science together with new methods of quantifying brain activity.

Transcendental meditation, eye movement directed therapy (EMDR), visualization, and the relaxation response are all now amenable to detailed elucidation. It seems likely that this spectrum of experimental treatments will have features in common and will be differentiated from one another as our power to study the human brain in action increases. Rather than trying, in vain, to make sharp boundary conditions in order to fence off therapeutic turf, it may be wiser to keep our minds open to commonalities and to new findings that explain subtle differences. Practitioners trained in one or another of these maverick techniques isolate themselves from each other at the expense of the curiosity essential to reductionistic science (where reduction is not the elimination of mind but the achievement of maximal explanatory power with the minimum number of assumptions). The overthrow of psychoanalysis must not be followed by the Balkanization of psychology for petty, vainglorious, and commercial reasons. Nor must we countenance the embarrassing and absurd distinctions made by proponents of biological psychiatry, which have tended to divide practitioners into pill-pushers and psychotherapists who just talk. At stake here are the bragging rights of medical doctors, who reserve the right to write prescriptions and thereby reduce the time to talk. The complete brain-mind scientist is as infrequent as he or she is welcome to the new protoconsciousness guild.

For those who are not satisfied with physiological models of psychosis

(like dreaming) or behaviorally induced altered states (like hypnosis and its several cousins), there is the hard stuff: chemicals like LSD, psilocybin, and other molecules that wreak havoc on the brain, producing mind trips of apparently unending fascination. In some cases, the effects are predictable by my new model. In all cases, the opportunity for experimental investigation of the brain chemical basis of mind is a scientific advance. The inevitable abuse of these chemicals by street users is, however, a grave social problem. Why anyone would want to risk sanity for psychotic kicks, when physiological REM is already a harmless and free nightly ego trip, is beyond my comprehension.

The Transcendental Ego

Because we are all endowed with an EGO and an ego that is auto-created and auto-creative, we are blessed with the talent for transcendence. By this, I do not mean spiritualism or otherworldly pursuits. For me, this mystical draw is understandable but unfortunate. Rather, I want to emphasize the originality, imagination, curiosity, and constructive pursuits of the arts and sciences that invite us all to a personal transcendence by which we rise above ourselves and achieve socially useful enlightenment. We need only tap into our dreams to realize how gifted we are. We can see in the dark with our eyes closed; these videos are far more exciting than those available on commercial TV, though it must be admitted that TV scriptwriters are waking dreamers and, as such, showing us the way to use our minds more fruitfully.

Two trends work against transcendence. One is the misguided effect of traditional education, which bullies us with the admiration of others whose excellence we can never hope to match. This is the negative injunction that leads to low self-esteem and dependence on external inputs. Instead of reverence for the other, I advocate the song of the self. Painting, writing, and musical composition are not the preserve of the talented. They are the domain of everyone who dreams. This universality of artistic capability goes unrecognized because the educational system to which we are all exposed not only says that these pursuits are not for us, but fails to sensitize us to our intrinsic talent, our auto-creativity. We do not need to go to school to learn to dream. But we do need help in learning to access our dreams. How many of you know that you can increase dream awareness and recall by the same sort of self-hypnosis that leads to lucid dreaming?

The technique is simple: begin by placing a pad of paper and a pencil, or if you prefer, a hand-held tape recorder, on your bedside table. When you turn out the light, take 30 seconds to give yourself the following suggestion: "I am a normal person and will have at least an hour and a half of dreaming tonight. I want to remember some of it. To help me remember, I need to wake up when the dream is going on. To help me do this, I need to notice the bizarreness which tells me that I am not awake but sleeping and dreaming." The self-hypnosis continues: "When I wake up with recall, I will record my memory. Later, when I have more dream recall than I can record, I may want to go on to become lucid, to control the plot of my dream (especially if it is unpleasant), but also to train my imagination by learning to fly, to make love to whom-ever I please, and to invent other fabulous dream plots. In this simple way I will transcend my humdrum existence and build my creative potential. My ego will grow, not in any sense of conceit, but simply through self-realization and self-celebration." This approach can be taught today or tomorrow in schools, dream groups, or psychotherapy. Long gone is the injunction against "manipulation" of the patient who must be allowed to remember a dream spontaneously, and bring it to the analyst for interpretation according to the theory of transference. Transference is for real and it has a place in scientific therapy but it should not and need not contaminate the more positive and realistic use of dreaming advocated here.

I have been keeping a dream journal for the past 40 years and now have detailed reports on about 1,000 dreams. My dreams strike me as directly revelatory of my hopes and fears rather than a disguise of my unconscious proclivities. It could be that my dreams are transparent, emphatic, and embarrassingly clear because of my immersion in Freudian theory during my training, but I think not. In fact, I think it is just the other way around. As in Sunday school, I wanted very much to believe what others accepted without question, but simply could not. My own personal flight into science, which psychoanalysis would regard as defensive resistance, was as liberating as it was an escape. Time will tell if I am right about this. Try what I suggest and see for yourself.

Religion and Sexuality

Two themes on which I share Freud's views wholeheartedly are religion and sexuality, not in theory but in practice. Of religion, we both want as

little as possible and of sex just the opposite. The two practices are very likely to be negatively correlated.

By religion, I refer to organized practice. Since my voice changed and I could not any longer sing falsetto, I have not been in church for a service unless social obligation necessitated my attendance (weddings, funerals, and baptisms, for example). I keep my mouth shut during prayers and remain seated when congregations kneel and stand up. The only time I go into a church without ambivalence is to hear a concert, especially of choral music, which I had learned to love during my five years as a choirboy.

Of belief, in a nonliturgical sense, I freely admit I am never free. No one can live a life without belief. My optimism and positive mindedness are religious. I can't prove that my faith in these traits is well founded. In this respect, I follow William James's (1890/1981) pragmatism, knowing full well that pragmatism is a slippery slope, allowing me to feel free of belief. When I say that positive thinking works for me and seems to me to work well for many of my friends and most of my patients, I would like to think that the principles of positive mindedness might one day pass the test of science. Meanwhile I will believe because I believe. EGO ERGO SUM.

Sigmund Freud was decidedly pessimistic and that may be his belief and, as such, every bit as religious as my own. All lives are clouded with misfortune, with sadness and loss, and these negative experiences may leave deep wounds, which can only be healed by guided introspection and the freeing up of depressed affect. But I insist that in attempting to create his psychology, Freud was not even ostensibly scientific. He believed in himself, considered himself a genius and the inventor of a new science. I am afraid that Freud was basically a religious leader who promulgated a speculative philosophy that he and his adherents have clung to with a tenacity that is the unmistakable hallmark of faith.

As for sexuality, Freud was no doubt correct in his assessment of its power to ruin the lives of women (who were condemned to self-abnegation and denial of desire) and men (who were obliged to lead secret sexual lives to protect themselves and their spouses from social opprobrium). Freud himself was one of those men and so am I. Freud and I were both as libertine as we were atheist and it was certainly in part our freedom to be sensual that we achieved at the expense of "Thou shalt not" church commandments. This is not an ad hominem argument. It is simply an unadulterated fact.

I have already expressed serious objections to the postulation of infantile sexuality. That boys prefer mothers to fathers and that mothers prefer sons to daughters may well be true, but to blow this foible up to the Oedipal/castration anxiety level is simply an imaginative excess that seriously impugns Freud's dream theory and the related theory of psychopathology. Because these are the two principal foundation stones of the Freudian faith, the whole church-like edifice built on top of it topples. For me, neither dreams nor infants are very much sexually motivated. There is simply no independent evidence that either assumption is correct, whereas there is abundant scientific evidence for contrary alternative mechanisms.

Sexuality does rear its ugly head in adolescence, and it is then well nigh impossible to get it right unless one subscribes to an organized religious doctrine that says what is right and what is wrong. In other words, the common reaction to sexual chaos and confusion is organized religion. The world is currently in the grips of a battle to the death between fundamentalism and libertarianism. It is not at all clear how this conflict can be resolved, but science and Freudian pseudoscience together form only a tiny minority with a seemingly hopeless opposition in the churches of the world.

Heat and Light

The death of sleep-deprived rats with a syndrome of metabolic and caloric thermal dyscontrol necessitates a functional theory of REM sleep as a state that guarantees thermoregulation. Hermann von Helmholtz (1867/1962) developed such a theory with his free energy concept. Complex systems, such as the brain, require exquisitely sensitive and reliable thermoregulation and REM sleep provides it, exactly how we do not yet know. But what about dreaming? How does that fit in?

The second part of Helmholtz's free energy theory is that a complex system like the brain must keep surprise (which is proportional to free energy) to a minimum. It does this by predicting the specific consequences of its own sensorimotor data collection, precisely the function that my laboratory team had deduced from our studies of REM sleep eye movement. These two lines of theory have recently come together, thanks to a fruitful collaboration with Karl Friston, a London-based psychiatrist and mathematically sophisticated student of free energy. Our ideas have now been published (Friston & Hobson, 2012).

By studying the REMs of cats while recording EEG and single-neuron discharge in the brain stem, we have been able to demonstrate that every eye movement was preceded by a burst of neuronal firing in the ipsilateral pontine brain stem and EEG waves recordable in the ipsilateral geniculate body (the visual relay nucleus of the thalamus) and the ipsilateral occipital cortex (Nelson, McCarley, & Hobson, 1983). These signals predicted the magnitude and direction of the upcoming eye movement. The robustness of this predictive power was greater in REM than in waking, a finding precisely congruent with the virtual reality model advanced for REM. The visual nature of dreams, we asserted, was subjective awareness of the building block of primary consciousness, a building block that was also essential to waking consciousness.

This clear evidence of specific predictive power fits with the more general hypothesis that REM sleep activates a virtual reality model of the world that is used in the construction of consciousness. In that view, consciousness can be seen as a real world (Hobson, 2009) replica that allows the conscious subject to anticipate and review important interactions between the self (EGO) and its environmental context. In dream consciousness we see evidence for an ongoing dialogue between genetic and epigenetic self-agendas, and the ambient challenges that the ego faces from day to day. In waking, various problem-solving strategies are tried out and the results reiterated through command central. In the next section of this article, I address the way in which this schema incorporates the sleep-memory data.

Memory

Modern sleep science has focused sharply upon evidence that new learning is consolidated by the offline activation of the brain in sleep. Both kinds of sleep participate in this process. Jan Born has studied the role of NREM sleep in fixating semantic (school learning) memory (Diekelmann & Born, 2010), whereas Robert Stickgold has looked at procedural (motor skill) learning (Wamsley & Stickgold, 2011). Recently, Matthew Walker (2010) began taking emotion into account. Despite the fact that subjects are unaware of their progress, they do better when retested after sleep. Two important consequences emerge from these studies: 1) sleep is not only important to energy homeostasis but to information management as well; and 2) substantial benefits may accrue entirely outside conscious

awareness. Conscious awareness may thus be more efficacious without our knowing why!

Integrating these findings with evidence that sleep restores other basic housekeeping functions, such as body temperature control and free energy reduction, we see that the genetic and epigenetic memory model of the world is abetted by experiential plasticity. In other words, an ego is instructed on how to be by two kinds of teaching: one is intrinsic and reflects the long-term survival value of eons of genetic tinkering; the other is extrinsic, allowing acute adaptive responses to local, here-and-now vicissitudes. So far, so good, but what about dreaming itself? If REM sleep is so all-fired important to procedural memory, why are dreams so strange? Why are they so deeply marked by discontinuity and incongruity? Surely this does not fit with any obvious rule-based learning theory.

It is precisely this conundrum that prompted Freud to invent his disguise-censorship model, posit dream symbolization, and analyze dream symbols using the method of free association. If this paradigm is flawed, what do we have to put in its place? I hate to end this great story on a promissory note—I freely admit that we aren't yet sure how to account for dream bizarreness—but we do, at least, have some very promising leads. The first lead is the commonsense realization that a thorough review of memory need not be orderly, especially if the review itself is not meant to be recognized or remembered. Memory in the brain may not be indexed like a book, or even like a dictionary. In other words, Jacques Lacan (1968) may be wrong when he declares, "the unconscious is structured like a language." If, for example, emotional salience is a more powerful ordering rule than grammatical structure, we ought to remain open in thinking about dream bizarreness. This means that we must not explain it away with a simple-minded nostrum like disguise censorship.

A second, similar possibility is that, in addition to thoroughness, a sleep memory review may need to link remote and proximal items. That means that item A of recent provenance needs to be linked, paired or associated with item B from the distant past, according to its emotional kinship, not its lexical or linguistic relationship. Discontinuity and incongruence would be an expected, natural consequence of such a review. Using a test of semantic priming, Spitzer, Stickgold, and Hobson (n.d.) found precisely that sort of kinship: following REM sleep awakening, subjects showed enhanced skill in recognizing remote associations, as if their memory systems were on the lookout for past-present pairings. Our

sleep memory restructuring may take surprising turns, and we should not expect that its rules will be the same as those of waking.

The third promising and closely related lead is Sue Llewellyn's (2011) concept of elaborative encoding. REM Sleep Dreams may not just enhance memory for today's or last year's experience. They may form emotionally meaningful complexes of experiential data from remote times, persons, and places. If this is true (and Spitzer et al.'s [n.d.] results are compatible with this idea), then the interpretation of dreams in psychotherapy could enjoy a scientifically dignified renaissance with elaborative encoding taking the place of disguise censorship. From an empirical standpoint, Spitzer et al.'s (n.d.) results must be confirmed and extended, perhaps in association with imaging studies designed to reveal in greater detail the associative neuronal networks that light up in REM.

Conclusions

Modern sleep and dream sciences forces such a radical rejection of Sigmund Freud's disguise censorship model that the supervening psychoanalytic theory structure is impugned. In its place, I detail the activation-synthesis and AIM models, based upon extensive sleep lab and animal neurophysiological evidence. To this solid scientific base, I add new ways of looking at the mind as a brain function. These include replacing the dynamically repressed unconscious with a view of the dreaming brain as the generator of a state of consciousness that is a fundamental building block of waking consciousness. In turn, this is linked with a view of REM sleep dreaming as providing a virtual reality model for the brain. The ontogenetic, phylogenetic, sleep laboratory, and clinical evidence for this functional hypothesis is reviewed and its sharp contrast with psychoanalytic assumptions articulated.

In need of correction are such now obsolete ideas as the tripartite model of the mind, the ego mechanisms of defense, the mechanisms of clinical symptom formation, and dream or clinical history analysis by the technique of free association, to name a few of the central shibboleths of Freudian theory; such shibboleths may now be discarded and replaced with the physiological mechanisms that Freud sought, but could not find in 1895.

A most exciting functional theory derives from the juxtaposition of the virtual reality model with data from sleep deprivation experiments, suggesting that Helmholtz's (2000) free energy theory correctly anticipates

the powerful thermoregulatory and predictive functions of REM sleep dreaming. With respect to the clinical use of dream content in psychotherapy, the possibility that remote, but emotionally salient, associations are made in REM attempts to rescue dream content from the cutting room floor of the brain's film studio.

REFERENCES

- Aserinsky, E., & Kleitman, N. (1953). Regularly occurring periods of ocular motility and concomitant phenomena during sleep. *Science*, *118*, 361–375.
- Bowlby, J. (1988). *A secure base: Parent-child attachment and healthy human development*. London: Routledge.
- Descartes, R. (1989). *Passions of the soul*. (S. H. Voss, trans.) Indianapolis, IN: Hackett. (Originally published 1649.)
- Diekelmann, S., & Born, J. (2010). The memory function of sleep. *Nature Reviews Neuroscience*, *11*(2), 114–126.
- Freud, S. (1950a). Project for a scientific psychology. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 1, pp. 281–391). London: Hogarth. (Originally published 1895.)
- Freud, S. (1950b). The interpretation of dreams. *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 4). London: Hogarth. (Originally published 1900.)
- Freud, S. (1990). New introductory lectures on psycho-analysis. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud*. New York, NY: Norton. (Original work published 1933.)
- Friston, K. J., & Hobson, J. A. (2012). Waking and dreaming consciousness: Neurobiological and functional considerations. *Progress in Neurobiology*, *98*(1), 82–98.
- Helmholtz, H. L. F. von. (2000). *Treatise on physiological optics*. (3 vols.) (J. P. C. Southall, ed.) (Translated from the 3rd German ed.) London: Thoemmes Press. (Originally published 1867).
- Hobson, J. A. (2009). REM sleep and dreaming: Towards a theory of protoconsciousness. *Nature Reviews Neuroscience*, *10*(11), 803–813.
- Hobson, J. A., & McCarley, R. W. (1977). The brain as a dream state generator: An activation-synthesis hypothesis of the dream process. *American Journal of Psychiatry*, *134*(12), 1335–1348.
- James, W. (1981). *The principles of psychology*. Cambridge, MA: Harvard University Press. (Originally published 1890.)
- Jung, C. G. (1957). *The undiscovered self (present and future)*. (1959 ed.) New York, NY: American Library.
- Kant, I. (1999). *Critique of pure reason* (P. Guyer & A. Wood, eds.) Cambridge: Cambridge University Press. (Originally published 1781.)

- LaBerge, S. (1990). Lucid dreaming: Psychophysiological studies of consciousness during REM sleep. In R. Bootzin, J. Kihlstrom, & D. L. Schachter (Eds.), *Sleep and cognition*. Washington, DC: American Psychological Association.
- Lacan, J. (1968). *The language of the self: The function of language in psychoanalysis*. Baltimore, MD: Johns Hopkins University Press.
- Llewellyn, S. (2011). If waking and dreaming consciousness became de-differentiated, would schizophrenia result? *Conscious Cognition*, 20(4), 1059–1083.
- Locke, J. (2009). *An essay concerning human understanding*. Greensboro, NC: WLC Books. (Originally published 1690.)
- McCarley, R. W., & Hobson, J. A. (1977). The neurobiological origins of psychoanalytic theory. *American Journal of Psychiatry*, 134(11), 1211–1221.
- Nelson, J. P., McCarley, R. W., & Hobson, J. A. (1983). REM sleep burst neurons, PGO waves and eye movement information. *Journal of Neurophysiology*, 50(4), 784–797.
- Rechtschaffen, A., Bergmann, B., Everson, C., Kushida, C., & Gilliland, M. (1989). Sleep deprivation in the rat. X. Integration and discussion of the findings. *Sleep*, 12(1), 68–87.
- Solms, M. (1997). *The neuropsychology of dreams: A clinico-anatomical study*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Spitzer, M., Stickgold, R., & Hobson, J. A. (n.d.) Unpublished data.
- Voss, U., Holzmann, R., Tuin, I., & Hobson, J. A. (2009). Lucid dreaming: A state of consciousness with features of both waking and non-lucid dreaming. *Sleep*, 32(9), 1191–2000.
- Walker, M. (2010). Sleep, memory and emotion. *Progress in Brain Research*, 185, 49–68.
- Wamsley, E. J., & Stickgold, R. (2011). Memory, sleep and dreaming: Experiencing consolidation. *Sleep Medicine Clinics*, 6(1), 97–108.

J. Allan Hobson, M.D., is professor psychiatry emeritus, Harvard Medical School. He trained at the Massachusetts Mental Health Center where he practiced clinical psychiatry and founded the Laboratory of Neurophysiology. His basic research on the brain stem control of REM sleep resulted in 200 peer-reviewed publications and 12 books. He divides his time between Boston and Italy where remains active via collaboration with scientists worldwide.

138 High Street
Brookline, MA 02445-6713
allan_hobson@bms.harvard.edu