Section I Chapter 1

Overview

Sleep medicine and psychiatry: history and significance

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Introduction

Psychiatry has not yet come fully to grips with sleep and dream research because it is not yet clear if or how the new science can replace the existing theoretical structures of the field. In terms of psychology, many psychiatrists still prefer psychoanalysis (despite its shortcomings) to the nascent cognitive psychiatry because psychoanalysis is more comprehensive and more hopeful. Sleep medicine has attracted some psychiatrists and provided the vast and reassuring data base of scientific medicine, but even that progressive move does not solve the mind–body problem that underlies psychiatry.

Initially posited by René Descartes in the seventeenth century, the notion of dualism of the mind and brain has been a central theme as psychiatry has developed. For much of its history, psychiatry has been polarized around the mind–brain dilemma, with major paradigm shifts pushing the field towards psychological versus biological trajectories. More recently, disenchantment with psychoanalysis and the growth of neurobiology and psychopharmacology have led many to proclaim themselves biological psychiatrists, and for them, sleep and dream research has provided some useful support. This belief, however, does little to solve the mind–brain problem that still fractures the field.

Sleep and dream research are truly foundational to psychiatry, and history reflects how psychiatry has struggled to come to terms with mind versus brain dualism. In the future, psychiatry may be advanced by taking advantage of the dramatic interaction between brain physiology, as it changes in sleep, and mental state. In reconstructing our notions of dreaming as an altered state of consciousness, rather than an unconscious mental state, we may begin to integrate the mind and brain in a more unified psychiatry.

Early history

In the late nineteenth and early twentieth century, medically oriented psychiatrists in Europe like Emil Kraepelin [1] and Eugen Bleuler [2] managed huge warehouses of deranged human beings. Their impact on the field of psychiatry is now widely acknowledged: Kraepelin for differentiating dementia praecox from manic depression; Bleuler for recognizing the former was not a true dementia, and subsequently coining the term "schizophrenia." Both were neurologically oriented and were masters of description and classification. Although they were hopeful the neurological basis for the mental illnesses they observed could be found, their work offered little insight into how the brain might mediate the horrendous symptoms of their patients. They ultimately had little to offer their patients in the way of treatment; in their time, a mentally ill person was sick for life.

Enter Sigmund Freud

Stimulated by speculative dynamic neurologists like Pierre Janet and Jean-Marie Charcot, Sigmund Freud created psychoanalysis in the same period Kraepelin and Bleuler labored. In so doing he turned away from both descriptive psychiatry and from brain science. He wanted to free his new theory of the mind from the shackles of medical science, especially neurology. This bold and rash revolt followed Freud's failure to produce a psychology based upon brain science of the time [3].

Of central importance to Freud's theory was his view of dreaming as an unconscious mental process by which dreamers could bowdlerize unacceptable unconscious wishes that threatened to invade consciousness and awaken them [4]. Freud's view was that dreaming was a process akin to the neuroses, which bedeviled his

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patients by day. He therefore resorted to dream interpretation using the patients' free associations to their dream material to reveal and relieve the noxious unconscious force of both dreams and neurosis.

The power of this ingeniously simple but completely speculative hypothesis grew to dominate European psychiatry. Followers of Freud, including Ernest Jones, spread psychoanalysis to America where it flourished to the point that by 1950, practically every department chairman and every professor of psychiatry in the United States was a psychoanalyst. Serious critics of psychoanalysis were few and far between. Those who were critical of psychoanalytic theory were often marginalized within the psychiatric community.

The discovery of REM sleep

In 1953, Eugene Aserinsky, then a graduate student studying physiology at the University of Chicago, wired up his 9-year-old son, Armand, and other children to perform electroencephalogram (EEG) and electro-oculogram (EOG) recordings in his rebellious experiments on attention carried out with the encouragement of the neurophysiologist, Ralph Gerard. As is so often the case, the monumental scientific discovery of REM sleep occurred in part by happenstance. When the child subjects became bored by Aserinsky's protocols, they fell asleep and, because they were young, evinced rapid eye movement (REM) periods shortly after sleep onset during which they dreamt. Aserinsky reported his observations to his supervisor, Nathaniel Kleitman, who suggested that they record the sleep of adults. The rest is history. All of Aserinsky and Kleitman's adult subjects showed EEG activation, REM periods, and when awakened reported long complex dreams, not at sleep onset but at 90–100 minute intervals throughout the night (Figure 1.1). Thus was modern sleep and dream science born [5].

Dream deprivation

William Dement, widely recognized as a pioneer in the field of sleep medicine, and a graduate student and psychiatrist working in Kleitman's laboratory at that time, was more interested in the dream story than his physiologist colleagues [6,7]. Dement was motivated by the conviction that he could test Freud's dream theory rigorously using the burgeoning knowledge of sleep physiology and REM sleep. By preventing subjects from entering REM with enforced awakenings, he and the neurobiologically educated psychoanalyst, Charles Fisher, theorized they could prevent dreaming and thus cause psychological distress in their subjects [8]. Although their subjects did become psychologically distressed, they were perhaps more importantly increasingly difficult to awaken from sleep. By the fifth night of the experiment, subjects made no less than 50 attempts to enter REM (up tenfold from five such attempts on the first night). This observation indicated that REM sleep, if not dreaming, was carefully conserved, and therefore must be important.

In the years to follow, the National Institutes of Health (NIMH) funded a significant number of laboratories focused on dream research. Subjects, usually students, were awakened during sleep so as to give reports of antecedent mental activity that were then correlated with polysomnographic data. The results were inconclusive and often contradictory. Controlled experiments by Anthony Kales, another psychiatrist involved in the early development of sleep research, revealed that NREM sleep interruption was every bit as psychonoxious as the enforced REM sleep awakenings [9], a finding that did not fit with the dominant psychoanalytic paradigm of the time. By 1975, when the NIMH ceased funding of "dream lab" research, the psychiatric community had made relatively few inroads into the scientific status of Freud's dream theory.

Neurobiological progress of sleep medicine

During the same period in which dream laboratory research was flourishing, remarkable progress was being made using the (feline) animal model of sleep that William Dement had also given the field [10]. The prime mover of this initiative was Michel Jouvet, a French neurosurgeon working in Lyon, who had spent a year at the University of California at Los Angeles (UCLA) founded by Horace Magoun, the co-discoverer with Giuseppe Moruzzi of the reticular activating system [11]. Jouvet quickly localized the REM generator system to the pons [12] and suggested that the forebrain was activated, the eyes were caused to move, and spinal reflexes were inhibited [13] during REM sleep all from that central locale. With this discovery, dreaming could thus be redefined as the inevitable subjective experience of a specific physiological pattern of brain activation in sleep. As it turned out, all mammals shared this brain activation process in sleep, casting doubt, albeit

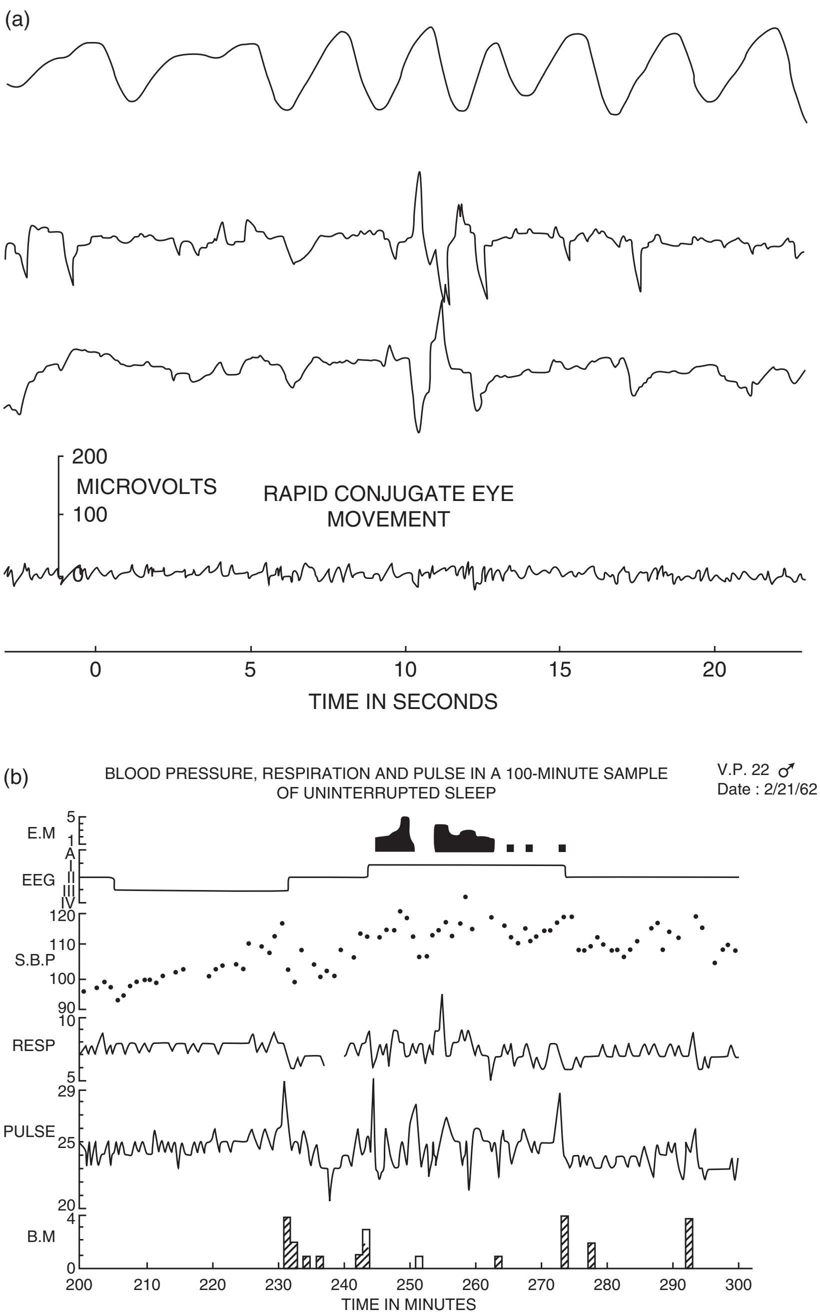

Figure 1.1 Rapid eye movement sleep. The state most highly correlated with dreaming is shown at three levels of temporal detail. (a) *Polygraphic level:* a 20 s segment shows conjugate REMs as out of phase; EOG tracings (Channel (Ch) 2+3) together with respiration (Ch 1) and EEG (Ch 4). (b) *Cycle level:* the coordination of events in the six polygraphic channels shown indicates that the NREM–REM sleep cycle is an organismic whole body phenomenon. One cycle of polygraphic data lasting 100 min shows distribution in time of eye movements (Ch 1); EEG sleep stage (Ch 2); systolic blood pressure (Ch 3); respiratory irregularity (Ch 4); heart rate irregularity (Ch 5); and body movement (Ch 6). (c) *All night level*: three nights of sleep showing evolution of EEG stages with time. Note that Stages III and IV of NREM sleep occur predominantly in the first two cycles while Stage II and Stage I REM predominate in the last two cycles of the night.

indirectly, on Freud's dream hypothesis. Under this new paradigm, REM sleep must be doing something besides serving purely as a substrate for unconsciously driven dreaming.

How was REM sleep instantiated by the pons? Jouvet's first guess, that it was enhanced cholinergic neuromodulation, turned out to be correct [12]. But when he read Kjell Fuxe and Anica Dahlstrom's description [14] of the noradrenergic and serotonergic neuronal systems of the pontine brainstem, he was sidetracked from his original (correct) hypothesis. Jouvet then suggested that norepinephrine drove

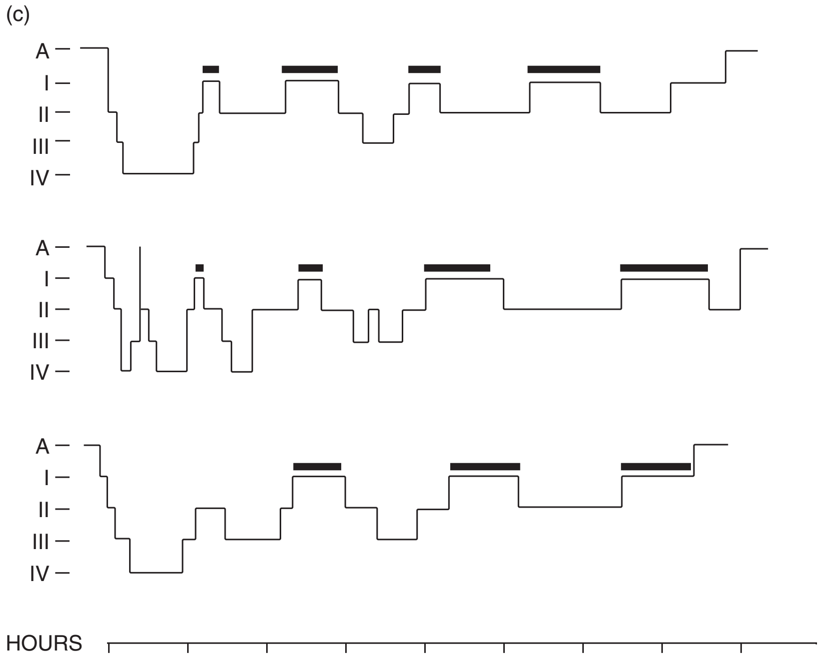

Figure 1.1 *(cont.)*

REM sleep and that serotonin drove NREM sleep while waking was the responsibility of dopamine [15]. By 1975, it was clear from single brainstem cell recording experiments that both norepinephrine and serotonin cells enhanced waking rather than sleep. Instead of being excited in REM, the aminergic neurons needed to be *inhibited* for REM sleep to occur. Acetylcholine-containing cells, on the other hand, turned back on during REM, firing at levels as high as or higher than during waking. Subsequent experiments utilizing cholinergic microstimulation demonstrated that REM sleep could be induced by these compounds. As was later discovered, dopamine-containing cells fired throughout the sleep–wake cycle eliminating any specific role for that neuromodulator in state (i.e. wake, REM, or NREM) determination. However, this does not mean this neurotransmitter has no role in sleep or dreaming, as it has been theorized that dopamine – acting in the absence of noradrenergic and serotonergic influence – may contribute to the psychosis-like quality of dreaming.

Robert McCarley (who at the time was my student at Harvard) and I, having trained in Jouvet's laboratory in the 1960s, recorded from individual pontine neurons for almost 10 years before we realized that the brainstem had its own switching device for waking and dreaming and that dreaming had a specific neurophysiological basis. From these findings, we constructed our "reciprocal interaction model", that posited the level of activation (e.g. wake, NREM, or REM) was determined by the aforementioned interaction of pontine cholinergic neurons with aminergic systems (Figure 1.2) [16,17]. In 1977, we published our corresponding "activation-synthesis hypothesis" of the dream process in the *American Journal of Psychiatry* [18], 1 month after issuing a paper that outlined the inaccuracies of Freud's neurobiological assumptions underlying psychoanalytic dream theory [19]. The activation-synthesis model proposed that an automatically activated forebrain synthesizes the dream by comparing information generated in specific brainstem circuits with information stored in memory. For the first time in 75 years, an alternative to Freud's theory of dreams became available with this model. The ensuing negative response from psychoanalytically oriented psychiatrists was fervent at the time, and this issue is still hotly debated, reflecting how deep the roots of Freudian psychology had grown within psychiatry.

The rise of sleep medicine

By the mid-1970s, experimental dream laboratories were failing, but modern sleep medicine was burgeoning. There was an exponential increase in pharmaceutical promotion of hypnotic sedatives and other

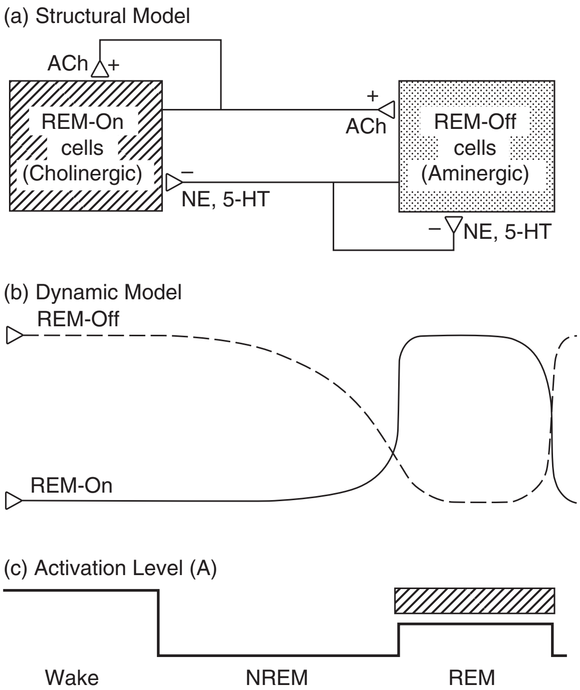

Figure 1.2 The original reciprocal interaction model of physiological mechanisms determining alterations in activation level. (a) Structural model of reciprocal interaction. REM-on cells of the pontine reticular formation are cholinoceptively excited and/or cholinergically excitatory (ACH1) at their synaptic endings. Pontine REM-off cells are noradrenergically (NE) or serotonergically (5HT) inhibitory [2] at their synapses. (b) Dynamic model. During waking, the pontine aminergic system is tonically activated and inhibits the pontine cholinergic system. During NREM sleep, aminergic inhibition gradually wanes and cholinergic excitation reciprocally waxes. At REM sleep onset, aminergic inhibition is shut off and cholinergic excitation reaches its high point. (c) Activation level. As a consequence of the interplay of the neuronal systems shown in (a) and (b), the net activation level of the brain (A) is at equally high levels in waking and REM sleep and at about half this peak level in NREM sleep. From Hobson JA. A new model of brain-mind state: activation level, input source, and mode of processing (AIM). In: Antrobus JS, Bertini M, eds. *The neuropsychology of sleep and dreaming*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1992; with permission from Taylor & Francis Group LLC.

psychoactive medications. This movement was helped by the fact that mental hospitals had already been dramatically emptied by drugs like chlorpromazine, first introduced in 1955 just 2 years after the discovery of REM sleep. By 1975, there was intense competition for market share among the sedative-hypnotics. A host of designer drugs for schizophrenia and major affective disorders was also soon developed. Many of the old dream laboratories of the 1953–1975 era were thus retooled as drug-testing laboratories. This influx of pharmaceutical money helped to maintain laboratory sleep research; however, commercial influence undoubtedly influenced some of the science it produced.

Although this was not a focus of their work, Aserinsky and Kleitman's original description of REM sleep included the recognition of concomitant changes in cardiorespiratory measures. As has been extensively demonstrated over the past 50 years, virtually every physiological system of the body undergoes a change of state over the sleep–wake cycle (see Chapter 3: Neurophysiology and neuroimaging of human sleep). Subsequent investigation has led to the recognition that such sleep-related changes may be unhealthy and in some individuals are clearly pathological. For example, respiratory commands may not be issued (central sleep apnea) and/or the commands may become blocked (obstructive sleep apnea) with deleterious effects on sleep itself and upon cardiorespiratory functions generally (see Chapter 7: Sleep-related breathing disorders).

Here again the charismatic leadership of William Dement in the development of modern sleep medicine must be recognized. In 1970, he founded the first sleep disorders clinic at Stanford University. Additionally, he has been instrumental in the growth and development of the professional and research societies that are the foundations of sleep medicine as a field. Today there are more than 1000 sleep medicine laboratories world wide and sleep-related medical problems are now increasingly recognized and treated. Very recently, the Accreditation Council for Graduate Medical Education (ACGME) has acknowledged sleep medicine as a distinct subspecialty, and begun accrediting training fellowships in clinical sleep medicine. However, despite the growth of sleep medicine as a discipline, there continues to be a dearth of education and training in sleep and its disorders, particularly among psychiatrists-in-training [20].

As an interdisciplinary medical specialty, sleep medicine has had numerous psychiatrists contribute to the field, many of whom have provided chapters for this volume. More comprehensive reviews of the history of sleep medicine are available elsewhere [21,22]. But the sleep medicine movement, as important as it is, has to date, unfortunately contributed little or nothing to the solution of the mind–body problem within psychiatry.

I would argue that the ultimate goal of psychiatry must be the pursuit of an integrative science of human consciousness. Of course, we want to understand the biological mechanisms underlying behavioral neuroscience. Why does a person – or a snail – investigate or withdraw from an object and what molecular processes underlie these behaviors? But the field has larger, more complex questions it must seek to answer. How can awareness arise from perception? How does learning become recollection? How does language arise? Although these are daunting questions, I believe that sleep and dream research will allow some of these questions ultimately to be answered.

The AIM model

As the reciprocal interaction and activation-synthesis hypotheses evolved, they metamorphosed into the AIM model based on findings in sleep and dream research [23]. Basic sleep research has identified three factors that interact to determine brain–mind state. Whether we are awake (with waking consciousness), in NREM asleep (with little or no consciousness), or in REM asleep (with dream consciousness) depends upon: (1) activation level (A) (which is high in wake and REM); (2) input–output gates (I) (which are open in wake but closed in REM); and (3) aminergic modulatory ratio (M) (which is high in wake and low in REM). Thus, the AIM (Activation, Input Source, and Modulation) model proposes that conscious states can be defined and distinguished from one another by the values of these three parameters. The three factors can be used to construct a three-dimensional AIM state space as shown in Figure 1.3. Waking, NREM, and REM occupy discreetly different domains in the state space. The wake–NREM–REM sleep cycle is seen as an elliptical trajectory in the state space with time as a fourth dimension.

The basic neurophysiology that occurs during the three AIM domains of waking, NREM, and REM sleep is shown in Figure 1.4. During REM, not only do external input–output gates close, but REM is also characterized by very strong internal stimuli generated via ponto-geniculo-occipital (PGO) waves [24,25,26,27]. These electrical impulses arise in the pons, then travel to the lateral geniculate and to the visual cortex. It is this distinctive, internally generated pseudo-sensorimotor stimulation that most directly supports the hypothesis that REM sleep dreaming is a protoconscious rather than an unconscious state. Not only is the brain activated and kept offline [28,29], but it autoactivates in such a way as to impressively simulate waking. Although inhibited, this system is

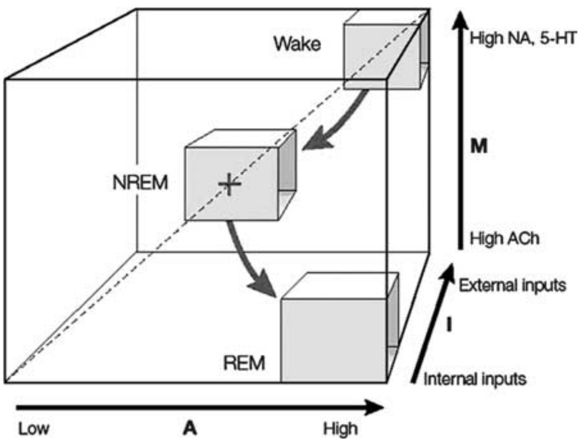

Figure 1.3 AIM model. In this figure, the fully alert, wake state is depicted in the upper right corner of the back plane of the cube. This corresponds to maximal levels of brain activation (right surface of cube), maximal external input sources with minimal internal sources (back surface), and maximal aminergic and minimal cholinergic neuromodulation (top surface). Cognitively, this corresponds to alertness with attention focused on the outside world. In the center of the cube lies deep NREM sleep, with low levels of brain activation, intermediate levels of both aminergic and cholinergic neuromodulation, and minimal levels of both external and internal input. In this state, the mind tends towards perseverative, non-progressive thinking with minimal hallucinatory activity, and this is reflected in the brevity and poverty of NREM sleep reports. As cholinergic modulation increases and aminergic modulation decreases, the modulatory function falls to its low point. The brain–mind, however, regains waking levels of activation and moves from NREM into REM sleep. AIM (here referring to the brain's location in the AIM state space) moves to the bottom front edge of the cube, with input now internally driven (front surface) and neuromodulation predominantly cholinergic (bottom surface). Note the paradox that instead of moving to the left surface of the cube – to a position diametrically opposed to waking – brain activation returns to waking level. This forces AIM to the right surface of the cube. As a result the mind is alert, but because it is demodulated and driven by powerful internal stimuli, it becomes both hallucinatory and unfocused. REM sleep's deviation from the main diagonal axis provides a visual representation of the distinctively unique phenomenology of REM sleep and shows why that state favors dreaming. Reprinted by permission from Macmillan Publishers Ltd: Nature Reviews Neuroscience (Hobson JA, Pace-Schott EF. The cognitive neuroscience of sleep: neuronal systems, consciousness and learning. 2002;3(9):679–693), copyright 2002.

also presumably used during waking to provide the brain with a model of the external world against which it compares inputs. I would hypothesize that waking provides this system with data, which it processes throughout life as dream content.

Dream consciousness

The Freudian in all of us still tends to regard dreaming as an unconscious mental activity. Even if we set aside psychoanalytic ideas about repressed infantile

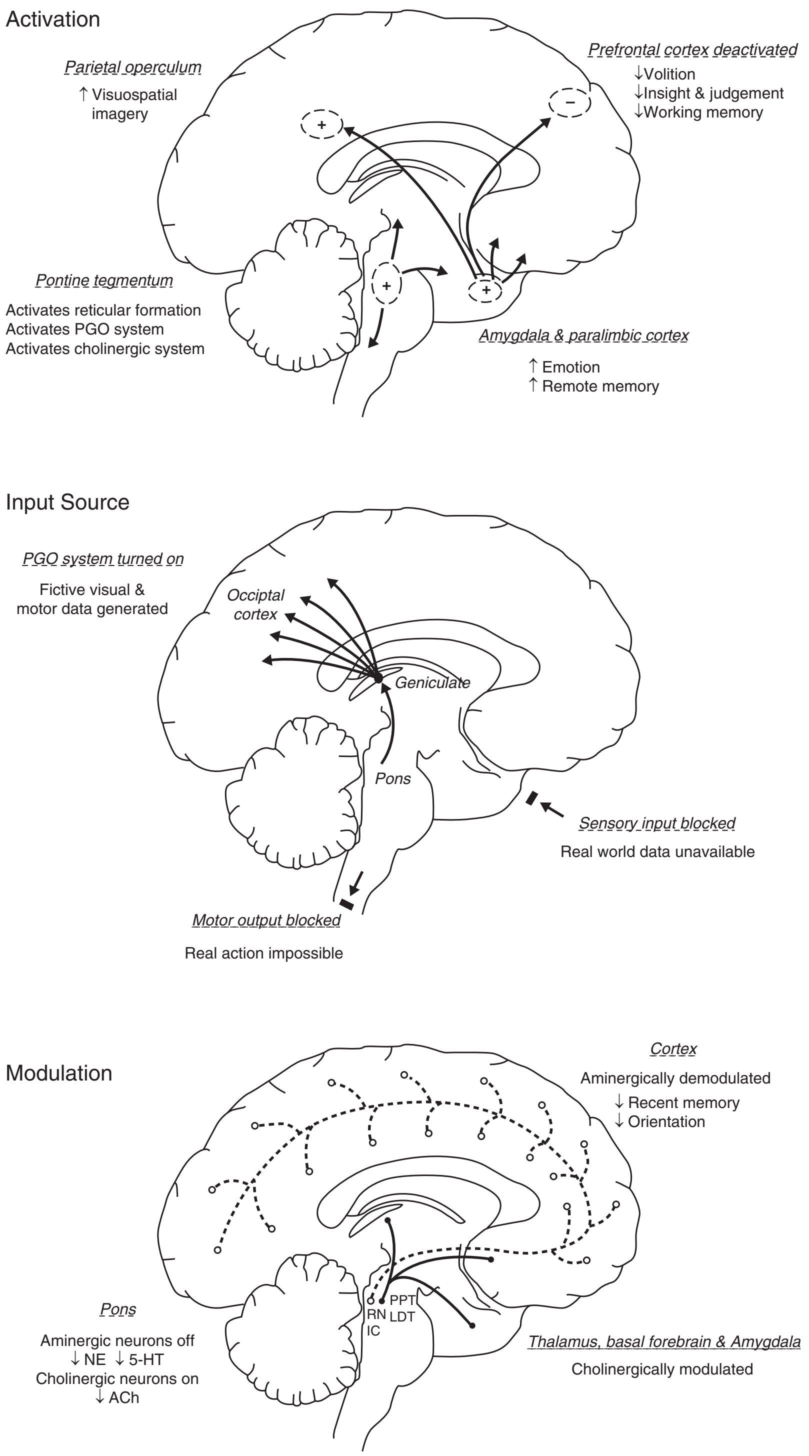

Figure 1.4 Physiological signs and regional brain mechanisms of REM sleep dreaming separated into the activation (A), input source (I), and modulation (M) functional components of the AIM model. Dynamic changes in A, I, and M during REM sleep dreaming are noted adjacent to each figure. Note that these are highly schematized depictions which illustrate global processes and do not attempt to comprehensively detail all the brain structures and their interactions which may be involved in REM sleep dreaming. From Hobson JA, Pace-Schott EF, Stickgold R. Dreaming and the brain: toward a cognitive neuroscience of conscious states. *Behav Brain Sci.* 2000 Dec;23(6):793–842, 2001; © Cambridge Journals, reproduced with permission.

wishes, their disguise, and their censorship, we still conceptualize dreaming as an unconscious process. Within this paradigm, dreaming, in its mysterious folds, contains insights about our secret selves discernible only through diligent study. Even if Freud was wrong about some of the details, most of psychiatry assumes he was right in this central hypothesis that dreaming is an unconscious process.

I would argue that this dogma has outlived its utility. If dreaming is not so much unconscious mental activity in a Freudian sense but is, instead, an intensely conscious experience that is not remembered, our theoretical perspective changes dramatically. Dream consciousness is vivid and distinctive, of that we can be sure, given our occasional recollection of it. Interestingly, despite the nearly 2 hours of REM sleep that occurs in a healthy adult each night, our recall of dreams comes nowhere near this amount. I argue that this discrepancy is not due to repression, but rather to the fact that the majority of dreaming (whether it occurs in REM sleep, NREM sleep, or at sleep onset) is forgotten. But if dreaming isn't disguising repressed infantile wishes, then what is it doing?

My heretical answer to this question is that dreaming is doing crucially important mental work. The mental work done by dream consciousness is far more important to waking consciousness than mere protection from unconscious infantile wishes as Freud suggested. I propose that dreaming is constantly serving consciousness in a variety of positive and progressive ways.

Aserinsky and Kleitman revisited: REM sleep and immaturity

The reason that Aserinsky stumbled onto REM sleep in the first place is because he was studying children who were bored and fell asleep and, fortunately, REM sleep occurs closer to sleep onset in the young. Not only does it occur at sleep onset but it occupies a greater proportion of a greater amount of sleep in the younger the child. The newborn human infant spends 50% of its sleep time in REM. Since infants sleep 16 hours per day, they achieve nearly 8 hours of REM sleep per day! With prematurity, these numbers increase further, until at 30 weeks of gestation, the human fetus spends 24 hours/day in a brain-activated state that is something more like REM sleep than wakefulness or NREM. Thus, I would argue that REM sleep in infancy serves brain development in the specific enhancement of cognition and consciousness.

This over-commitment to REM sleep by immature animals has not gone unnoticed. Howard Roffwarg, Joseph Muzio, and William Dement theorized in 1966 that REM favored development of the visual system [30]. Given the REM periods themselves, the PGO waves, and the intensely visual quality of dreams, I have always liked this idea and regret that it never received its day in scientific court. But I suspect the developmental hypothesis of Roffwarg and colleagues was too modest. I would argue that it is not just vision, but consciousness itself that is the functional beneficiary of REM sleep.

Developmental considerations

Brain development proceeds, up to a point, under genetic guidance. Chemical flavors are designated and neuronal addresses are specified by the genome. When cholinergic and aminergic neurons meet in the pontine brainstem they interact automatically and spontaneously. When the cholinergic system is dominant as it is in REM, the brain is activated in one specific mode and when the aminergic system is dominant as in waking, it is activated in another specific mode. According to this theory, the aminergic system must develop later than the cholinergic system since waking consciousness follows dream consciousness by weeks or even months.

Although antecedence does not guarantee causality, this temporal sequence means that REM sleep could be a protoconscious state. What is meant by the term protoconsciousness? First, it means that a primitive sense of self could be instantiated. To paraphrase Descartes, my brain is activated, therefore I am. When my self (or ego) is activated, I move. My self is therefore an agent. This is point two. According to Rodolfo Llinás, agent-initiated movement is instantiated early in development [31]. Not only does the self-organized autoactive brain instantiate agent-initiated movement but it simulates both the sensory and emotional concomitants of that activity. These are points 3 and 4. REM sleep creates a self that acts, and feels, in a virtual world.

REM sleep and the binding problem

One of the most remarkable aspects of waking consciousness is its unity. Consciousness integrates a vast panoply of information into what seems to us to be a simple and continuous flow of awareness. Strands of data from the outside world, from our bodies, and our very complex selves are woven together into a single piece. Our subjectivity may be conflicted but it is always unified. Such an effect can only be achieved by the binding of multiple neuronal representations into an integrated whole. Rather than assuming that numerous neural pathways pump all of this information into a single place in the brain, it has been proposed that it is the synchrony of disparate brain parts that is the substrate of binding. Now we know that, in addition to synchrony, the brain utilizes modulatory chemistry to achieve the widespread harmony necessary to binding.

According to protoconsciousness theory, REM sleep serves binding automatically and spontaneously. No supervision is needed. And according to this new theory, all mammals that have REM sleep have protoconsciousness. When they wake up, they have varying degrees of what Gerald Edelman calls primary consciousness [32]. According to the complexity of their brains, they may also achieve some degree of secondary consciousness. But, as far as we know, only humans have directed thought, propositional intent, and awareness-of-awareness. This sophisticated adaptation is presumably dependent on the acquisition of symbolic language.

The interaction of dreaming and waking consciousness

Protoconsciousness develops first, even before birth. There follows, especially in humans, a prolonged period in which waking consciousness develops. It is an explicit tenet of the protoconsciousness hypothesis that dreaming and waking consciousness develop together and that each of the two states enriches the other. Furthermore, it is proposed that the two states may interact negatively in the production of psychotic states such as the organic mental syndrome, schizophrenia, and major affective disorder.

Since REM sleep brain activation precedes waking (and may occur before even birth), it follows that while it may instantiate self, self-as-agent, movement, sensation, and emotion, it could not support dreaming as we know it in adults. For adult dreaming to occur, specific content information would need to be gleaned in waking and cognitive capacity would need to evolve, as it clearly does, accounting for the fact that adult dreaming does not occur before ages 6–8 [33]. Another empirical example of this principle is the vision-free dreaming of the congenitally blind person. Vice versa, in order for a normal person to see, in either waking or dreaming consciousness, the contentless formal frame supplied by REM sleep brain activation is essential.

The emerging picture is of a two-way street: REM sleep brain activation provides the formal substrate for waking consciousness and waking consciousness provides the perceptual building blocks for dream consciousness.

Summary and conclusions

Psychiatry was born when moral and medical forces combined to separate the mentally ill from common criminals and other social undesirables. In the beginning, the medical model prevailed but no bacteria, no viruses, and no malformations were found in the brains of the vast majority of the severely mentally ill.

Frustration with the organic orientation of the field contributed to the uncritical acceptance of the psychoanalytic psychology of Sigmund Freud who based much of his speculation on the assumption that dreaming was an unconscious mental process inimical to waking consciousness. This point of view gained ascendance in the first half of the twentieth century and continues to have support within psychoanalytic circles.

The discovery of REM sleep, and its association with dreaming by Aserinsky and Kleitman in 1953, was first greeted by many in the psychiatric community as an opportunity to confirm Freud. But as the second half of the twentieth century evolved, it become more and more clear that REM sleep likely has biological significance that transcends dreaming. During this same period, the field of sleep medicine exponentially developed, with many biologically oriented psychiatrists contributing significantly to this nascent medical specialty.

Significant progress in basic sleep and dreaming research has yielded new insights previously unimaginable at the dawn of psychiatry. Now, in the twenty-first century, psychiatric sleep medicine continues to move forward with developments in sleep genetics, bioenergetics, neurophysiology, and neuropharmacology. Within modern paradigms, it seems more likely that REM sleep (and dreaming) are the handmaidens of waking consciousness, rather than the "royal road to the unconscious" as previously envisioned by Freud. I suggest that REM sleep comes to support protoconsciousness (and dreams) in a way that is specific and dynamic. It is possible that further consideration of the connection between REM sleep dreaming and waking consciousness will yield the brain–mind integration necessary to a truly scientific psychiatry. This theory is developed in more detail in a recent manuscript [34].

It is thus my deeply held belief that psychiatry might well come of scientific age through an integration of basic research of sleep, dreams, and consciousness. By this surprising means, it may be possible for psychiatry not only to contribute to, but also to profit from, a specific model of brain–mind integration that could account for both normal and abnormal mental states.

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