

INTRODUCTION

There is considerable disagreement among practitioners in the human and life sciences concerning the functional significance of dreaming even though the general outlines of the methodological requirements for a functional analysis of dreaming have been available for over a decade (Kramer, 1980). It might be tempting to attribute this disagreement to the successive difficulties during this century of psychoanalysis, psychiatry, sleep and dream psychophysiology and cognitive science to “give an account” of dreaming, in particular, a functional account explicating the goal-directed nature of such activity (Sternberg and Smith, 1988). Many cognitive scientists fail to see why they should be interested in sleeping and dreaming when they have it on good authority that dreaming is a biological epiphenomenon, random, meaningless and without goal direction. Epistemologically, dreaming has been regarded as a source of error rather than fact or truth just as ontologically it is a state of false consciousness (Malcom, 1959). Such views are not new. They can be found in the Nineteenth century, the Renaissance, and earlier (Lavie and Hobson, 1986; Ruprecht, 1990). There are, of course, those who disagree, then and now. For example, more than ten years ago Kramer (1982) argued that the functional significance of dream content on subsequent wakefulness was more likely to be affective than cognitive in nature.

The purpose of the present volume is to present a diverse collection of modern views of this perennial question by theoreticians, researchers, and practitioners of the human and life sciences. Not all those invited were able to participate. Therefore, the majority of the chapters that follow are positively disposed to the proposition that dreaming is functionally significant. We hope they stimulate new theory and research. We did not include contributions from the humanities because they were beyond our areas of competence as editors.

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By *dreaming* we refer to any image, thought or feeling attributed by the dreamer to a preawakening state. The experience of dreaming and its recall vary within and among individuals across cultures along the following dimensions: frequency, quantity, quality, and type (Von Grunebaum and Callois, 1966). These dimensions of dreaming are culturally and historically universal, appearing during ontogeny at about three years of age, if not earlier (Foulkes, Chapter 1, this volume). Their emergence, development and transformation are strongly constrained by both biology and culture (Chapters 1–3, this volume). Thus, contributors to the present volume include anthropologists, psychologists, psychiatrists, neurologists, and biologists.

According to Fishbein (1976, p. 8) there are four possible classes of interpretations of the functional significance of such universals. These are presented in Table 1. The strongest class of interpretations assigns some function to dreaming at the time of its occurrence. The second class of interpretations views dreaming as not functionally significant at the time of its occurrence, but claims that it is necessary to build something that is functionally significant. The third class of interpretations views dreaming as not functionally significant by itself but in combination with other things it can build something that is functionally significant. The weakest interpretation assigns only an index or indicator function to dreaming and dream recall. This is dreaming as epiphenomenon, in which dreaming is a nonfunctional by-product of some other activity that is functionally significant. Such interpretations view dreaming as a

Table 1.

Classes of Interpretation of the Functional Significance of Dreaming

1. The characteristic has survival value at that point in development
2. The characteristic does not have survival value at that point in development, but it is necessary to build another characteristic that eventually will have high survival value.
3. The characteristic does not have survival value at that point in development, but it will eventually be combined with other characteristics, the combination eventually having high survival value.
4. The characteristic itself does not have high survival value, but it is the outcome of a characteristic that falls in one of the first three categories.
5. The characteristic itself does not have high survival value, and it is not the outcome of a characteristic that falls in one of the first four categories.

Source: After Fishbein, 1976, p. 8.

window onto something else. A fifth possibility can be added suggesting that dreaming and dream recall have no function at all even as indices of other cultural, psychological, or biological processes.

All traditional and modern theories of dreaming, whether ideographic or nomothetic can be classified within these alternatives. Anthropological, developmental, personality and clinical theories usually emphasize the first three interpretations of Table 1, whereas cognitive, neurocognitive and biological theories tend to emphasize the fourth and the fifth possibilities. We call theories of dreaming that fall in the fourth and fifth categories *static functional theories*. Those falling in the first three categories are called *dynamic functional theories*. The details of dynamic functional theories differ. Their commonality resides in attributing some form of functional significance to variations within and among individuals within and among cultures in the dimensions of dreaming in the process of adaptation. The majority of the chapters in this book propose dynamic functional theories of dreaming. They differ in the extent to which dreaming is seen as having immediate or delayed causal consequences either alone or in combination with other psychological, developmental and cultural processes. In fact, functional dream theory is inconsistent only with assertions falling in the fourth and fifth categories of Table 1. Even apparently afunctional or antifunctional theories of dreaming such as the activation synthesis hypothesis (Hobson, 1988; Mamelak and Hobson, 1989), and various neural net theories (Crick and Mitchison, 1983, 1986; Hinton and Sejnowski, 1986) fall in the first three categories of Table 1. Part of the popular confusion on this point derives from the failure to appreciate that the apparent randomness of dreaming at the physiological level is neutral with respect to the functional significance of dreaming at the psychological level.

Dreaming can also index self-regulatory processes without participating in self-regulation—a category four interpretation of Table 1. The important question for indexical approaches to dreaming, and the distinguishing feature between them and interpretations that deny dreaming such a function concerns whether dreaming is a reliable epiphenomenon, not whether it is an epiphenomenon. If reliable, dreaming can at least be granted the significance associated with category four interpretations. Although not centrally important for functional theories of dreaming, an indexical use of dreaming may throw significant light on the possible functional significance of other systems. Two recent examples are noteworthy. Gaines and Price-Williams (1990) have documented important differences among American and Balinese artists in how

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dreaming indexes and participates in the creative imagination in artists from these two cultures. Cuddy (1990) found that controlling statistically for prior sexual abuse eliminated gender differences in the frequency of experiencing nightmares. Indeed, the chapters of this book abound with examples of dreaming serving an indexical function. Often what is being indexed is the functional integrity of systems of adaptation that transcend dreaming and include it as a component. These will vary developmentally and cross culturally as Foulkes and McManus, Laughlin and Shearer (Chapters 1 and 2) suggest.

It is at this point that the supposed biologically based randomness of dreaming becomes important. The usual understanding, associated with various readings of the claims of the activation-synthesis hypothesis (Hobson, 1988; Hobson and McCarley, 1977; Mamelak and Hobson, 1989), that dreaming is both meaningless and functionless because it is random, is incorrect. For example, the Boltzmann machine model of sleeping, dreaming and waking self-regulation proposed by Hinton and Sejnowski (1986) sees dreaming as a random, REM-dependent process with immediate functional significance for wakefulness in the context of learning, relearning and self-regulation, a category one interpretation. The fact that dreaming is not random at the levels of content or process simply reinforces the point that randomness has nothing to do with the meaningfulness or the functional significance of dreaming. Crick and Mitchison (1983; 1986) have been widely misunderstood as having proposed an antifunctional theory of dreaming. This too is incorrect. For them, dreaming is error in a pattern recognition system serving an immediate adaptive function, when forgotten, in maintaining the sensitivity and selectivity of the pattern recognition system of waking consciousness. Dream recall for them is the propagation of error into the waking pattern recognition system with the potential to destabilize the functional integrity of that system. In the classification of Table 1, this is a category 1 explanation, sharpened by Occam's razor. Although their theory has not received wide support (see Globus, Chapter 4) and appears to be incorrect in detail (see Smith, Chapter 10), it has stimulated a great deal of rethinking of the functional significance of dreaming. In particular, their theory has provided one of the clearest rationales for cognitive science not to be interested in dreaming, except as a source of error to be minimized. It is hoped that the contents of this volume will provide reasons for a broader interest in the functional significance of dreaming and dream recall.

It is important to note that Crick and Mitchison's theory provides a good explanatory fit to the attitudes and values of a reasonably large number of individuals known to at least one of the editors. This editor once was informed by an acquaintance that, like Ruskin, the person hated dreaming and avoided it whenever possible. No dreaming as fountain of creativity for this person, not even dreaming as entertainment. Kramer (Kramer, Schoen, and Kinney, 1984) was the first to find a relation between dream repression and adaptation in a study of Chronic Delayed Post Traumatic Stress Disorder. Lavie and Kaminer (Kaminer and Lavie, 1989; Lavie and Kaminer, 1991) have reported similar findings in a study of the long term adaptation of victims of the holocaust. These findings suggest that Crick and Mitchison's theory may provide a tentative description of the adaptive significance of dream recall in the lives of some individuals even if the specific mechanisms they propose are incorrect.

Difficulties such as these indicate that an adequate theory of the functional significance of dreaming must account for both patterns of remembering as well as patterns of forgetting dreaming. These issues are addressed in Chapter 4 by Globus, who revises connectionist theory with dream remembering rather than dream forgetting as the focus; in Chapter 3 by Koukkou and Lehmann, who propose a neurobiological model of dreaming and dream recall; and in Chapter 2 by McManus, Laughlin and Shearer who propose an anthropologically informed neurobiological model of dreaming and waking.

Many of the chapters in the present volume indicate that dreaming is orderly and can be used to index other biological, psychological, and cultural processes (Kramer, 1982). In addition, the dynamics of dreaming appear to be implicated in the organization and functioning of self at the deepest levels within culture. The functions served are complex, including not only experiential, affective and cognitive aspects; they are also epistemic and meta-epistemic, having to do with knowing that we know and how we regard what we think we know (Doniger-O'Flaherty, 1984; Kitchener, 1983). The developmental psychology of dreaming within and among cultures is a major area of neglect deserving immediate attention. Ideographic, nomothetic and comparative studies of the development of dreaming are essential for this field of interest to progress (see Foulkes, Chapter 1). Only by establishing similarities and differences in the patterns of development of dreaming across cultures can we begin to comprehend the relative and interactive roles of biology and culture in the functional significance of dreaming and dream recall.

A systematic ambiguity runs through the collection of chapters in the present volume. Stage REM sleep and dreaming are widely regarded as natural synonyms by many. For others, the identification of stage REM sleep and dreaming is entirely wrongheaded. It incorrectly permits questions about the dreaming of infants and other species of mammals and avians and ignores the fact that we probably dream throughout sleep. For still others, dreaming is a human psychological process that can be properly discussed without reference to the underlying stage of sleep. The editors are aware of these differences and have not imposed an artificial unity where none exists. Getting the semantics straight is one of the important tasks for those interested in the functional significance of dreaming. Stewart and Tall (1983) have observed that it is a cardinal principal of mathematics not to throw away a good idea just because it does not work. It is much the same with the association of REM and dreaming. People are not going to give it up simply because it is not correct. The functional significance of dreaming may be independent of the functional significance of any stage of sleep (see Purcell, Moffitt, and Hoffmann, Chapter 6). On the other hand, even if dreaming is continuous throughout sleep, its functional range and significance may be contextually dependent on the stage of sleep during which it happens. Lucid dreaming, for example, occurs mainly during stage REM and descent stage 1 NREM sleep. Similarly, dreaming may enhance or interact with functions proposed for particular stages of sleep, such as the maintenance of search, memory, signal detection and problem solving during REM sleep (see Chapters 7, 10, 11, and 12). In this vein, Kramer (Chapter 5) has been successful in carefully delineating the mood regulating effects of dreams from the mood regulating effects of sleep. The interaction of dreaming with the REM sleep functions proposed by these authors opens interesting possibilities for further research and theory. The nature of the contextual dependency of the functions of dreaming on NREM sleep, especially when stages 2 and 4 are differentiated, remains to be determined (see Chapter 3).

Many chapters in the present volume testify that the boundary between waking and sleeping is causally permeable in both directions. Koulack's chapter explores the adaptive response of dreaming to stress. Greenberg and Pearlman explore dreaming as adaptive problem solving in response to challenges to the self. Moreover, the permeability of the sleep-wake boundary and, indeed, the nature of the waking and sleeping states are themselves bounded and shaped by cultural factors operating morphogenetically during ontogeny. Dentan and McKlusky

(Chapter 15) and Kracke (Chapter 14) indicate the range and roles of cultural interpretations of dreaming, whereas McManus, Laughlin, and Shearer (Chapter 2) argue that the functional significance of wakefulness, sleeping, and dreaming is shaped ontogenetically by culture. The claims of Malcom and Crick and Mitchison that dreaming is a source of error cannot be sustained. Dreams and their waking interpretations can be correct rather than erroneous. Lucid dreaming is a case in point, as are other examples in this volume of successful problem solving in dreams and as a result of dreaming. Whether and how the ability of dreaming to be referentially correct differs both within and among individuals and cultures over time are interesting topics for future research. Those individuals and cultures who do no such parsing of experience need to be further divided into those who can but do not, those who cannot, and those who will not. The functional significance of the forgetting of dream experience, in the form of incomprehension or nonrecall, is unlikely to be the same in these three groups, especially when considered across cultures. Developmental, cultural, and individual factors will form and limit the capacity of dreaming to parse certain forms of waking and sleeping experience. NREM dreaming emerges later in ontogeny, after five years of age, than REM dreaming, which emerges between three and five years. Lucid dreaming emerges later than both of these, sometimes as early as adolescence. However, many adults have never experienced lucid dreaming, so the emergence of this type of dreaming is not developmentally inevitable. The emergence of dreaming during development is inevitable. If dreaming is an epiphenomenon, it is an inevitable epiphenomenon developmentally with the capacity to produce correct direct and indirect reference.

For the functions of dreaming to inevitably require forgetting during development in large numbers of individuals would require a cultural context considerably more hostile to dreaming than found in most cultures today, or an experiential context so traumatic that dream forgetting is not only the most appropriate adaptive response it is also the most desired, as when a person plagued by recurrent nightmares wishes the release of dreamless sleep. An interesting follow-up to Antobus's claim (Chapter 16) that we can do without dreaming might be to examine those who would like to but cannot. Domhoff (Chapter 8) deals with a related issue in his chapter on the functional significance of recurrent dreams, as do Kuiken and Sikora (Chapter 13) in a different manner by examining the impact of memorable dreams. Just as waking consciousness can be intrusive on dreaming, dreaming can be intrusive upon

waking consciousness both cognitively and affectively (Chapters 5, 6, 9, and 13). It is with such dreaming that we approach category one and two explanations in the Fishbein scheme (Table 1), dreaming that has immediate or nearly immediate adaptive significance.

References

- Cuddy, M. (1990). "Predicting Sexual Abuse from Dissociation, Somatization and Nightmares." Ph.D. dissertation, York University, Downsview, Ontario.
- Crick, F., and Mitchison, G. (1983). "The Function of Dream Sleep." *Nature* 30: 111–114.
- . (1986). "REM Sleep and Neural Nets." *The Journal of Mind and Behavior* 5: 81–98.
- Doniger-O'Flaherty, W. (1984). *Dreams, Illusions and Other Realities*. Chicago: University of Chicago Press.
- Fishbein, H. (1976). *Evolution, Development and Children's Learning*. Goodyear Publishing Company, Inc.: Pacific Palisades, California.
- Foulkes, D. (1985). *Dreaming: A Cognitive-Psychological analysis*. Hillsdale, N.J.: Lawrence Erlbaum Associates.
- Gaines, R., and Price-Williams, D. (1990). "Dreams and Imaginative Processes in American and Balinese Artists." *Psychiatric Journal of the University of Ottawa* 15, no. 2: 107–110.
- Hinton, G., and Sejnowski, T. (1986). "Learning and Relearning in Boltzmann Machines." In D. Rumelhart and J. McClelland (Eds.), *Parallel Distributed Processing*, vol. 1, pp. 282–317. Cambridge, Mass.: MIT Press.
- Hobson, A. (1988). *The Dreaming Brain*. New York: Basic Books.
- , and McCarley, R. (1977). "The Brain as a Dream State Generator: An Activation-Synthesis Hypothesis of the Dream Process." *American Journal of Psychiatry* 134: 97–112.

- Kaminer, H., and Lavie, P. (1989). "Dreaming and Long Term Adjustment to Severe Trauma." *Sleep Research* 18: 146.
- Kitchener, K. (1983). "Cognition, Meta-Cognition and Epistemic Cognition." *Human Development* 26: 222-232.
- Kramer, M. (1982). "The Psychology of the Dream: Art or Science." *Psychiatric Journal of the University of Ottawa* 7: 87-100.
- Kramer, M. (1980). "The Function of Psychological Dreaming: a Preliminary Analysis." *5th European Congress of Sleep Research*, Amsterdam, Basil, Switzerland; Karger, pp. 182-185.
- , Schoen, L., and Kinney, L. (1984). "The Dream Experience in Dream Disturbed Vietnam Veterans." In B. Vanderkolk (Ed.), *Post Traumatic Stress Disorders: Psychological and Biological Sequellae*. Washington, D.C.: American Psychiatric Press.
- Lavie, P., and Hobson, A. (1986). "Origin of Dreams: Anticipation of Modern Theories in the Philosophy and Physiology of the Eighteenth and Nineteenth Centuries." *Psychological Bulletin* 100, no. 2: 229-240.
- , and Kaminer, H. (1991). "Dreams that Poison Sleep: Dreaming in Holocaust Survivors." *Dreaming* 1, no. 1: 11-22.
- Malcom, N. (1959). *Dreaming*. London: Routededge and Kegan Paul.
- Mamelak, A., and Hobson, A. (1989). "Dream Bizarreness as the Cognitive Correlate of Altered Neuronal Behavior in REM Sleep." *Journal of Cognitive Neuroscience* 1: 201-222.
- Rupperecht, C. (1990). "Our Unacknowledged Ancestors: Dream Theorists of Antiquity, the Middle Ages and the Renaissance." *Psychiatric Journal of the University of Ottawa*, 15, no. 2: 117-122.
- Stewart, I., and Tall, D. (1983). *Complex Analysis: The Hitchhiker's Guide to the Plane*. Cambridge: Cambridge University Press.
- Sternberg, R. J., and Smith, E. E. (Eds.) (1988). *The Psychology of Human Thought*. Cambridge: Cambridge University Press.
- Von Grunebaum, G., and Callois, R. (Eds.) (1966). *The Dream and Human Societies*. Berkeley: University of California Press.