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DREAMTIME

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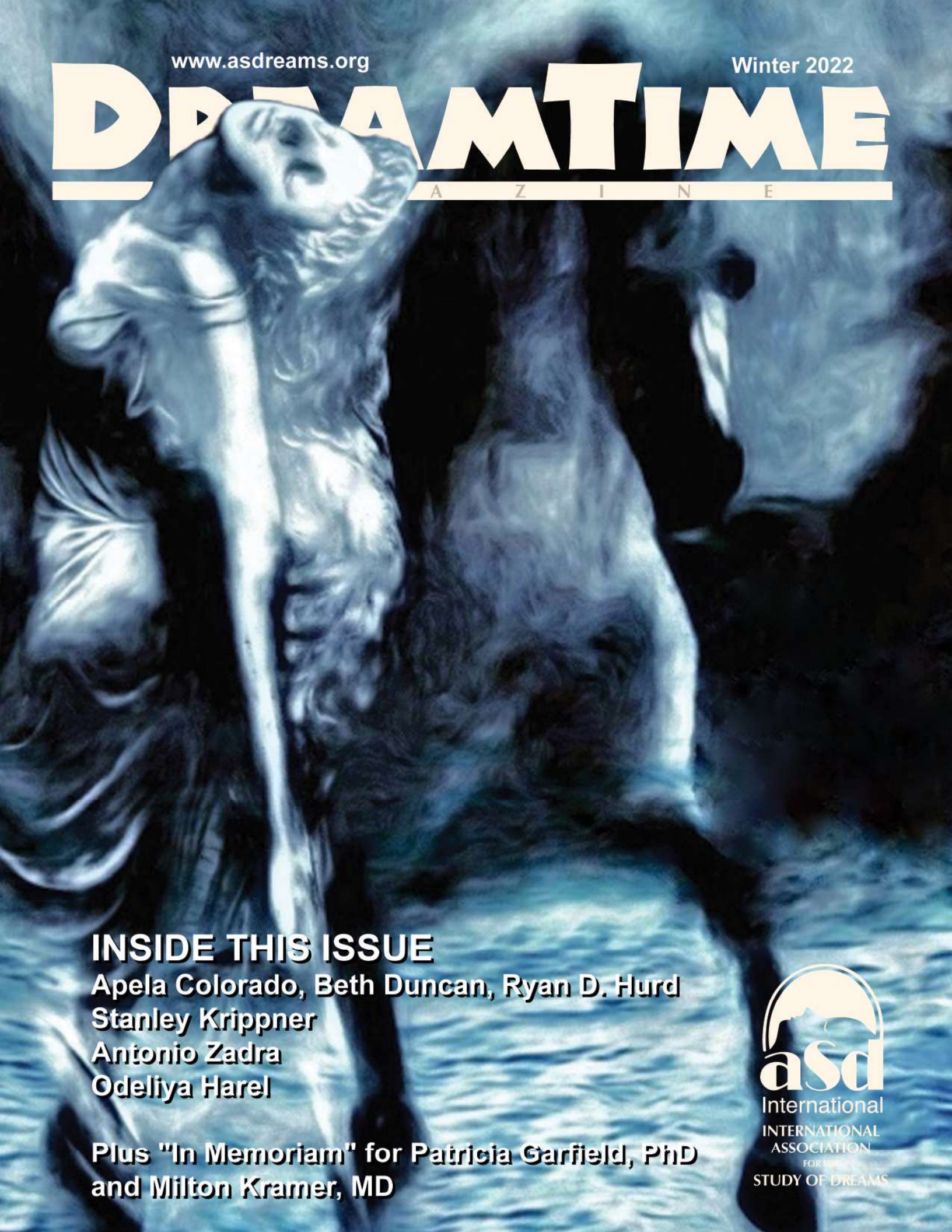

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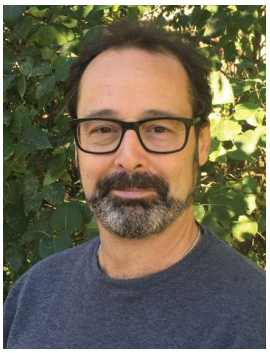
Why Brains Need to Dream

Antonio Zadra



What are dreams? Why do we dream? Where do dreams come from? These kinds of questions have probably existed, in some form or another, ever since human minds began to take shape in our distant ancestors. Over millennia, these questions have given rise to countless speculations, theories and beliefs about the possible origin and function of dreams. From the 4,000-year-old Epic of Gilgamesh—the world's oldest recorded story—to ancient Greek philosophy to age-old religious texts and spiritual practices, dreams have held a privileged place in human history, helping shape people's conception of the world as well as their place within it. What's more, based on the number of articles, books and online resources and forums dedicated to the science, meaning and personal uses of dreams, it seems that our fascination with all things dreams is as vibrant today as it ever was. But are we any closer to answering these enduring questions about the nature and possible function of dreams? As a longtime dream researcher, I certainly think so, provided we are willing to accept ever-evolving theories and ideas as opposed to fixed, definite answers.

Many *DreamTime* readers will be familiar with the classis works of Freud, Jung and Perls as well as the dream-related contributions of other great thinkers, such as James Hillman, Medard Boss, Calvin Hall, Stanley Krippner and Montague Ullman, to name a few. Some of you will have delved into a range of other contemporary theories about the how and why of dreams, including the innovative ideas put forth by Antti Revonsuo, Bill Domhoff, or the late Rosalind Cartwright and Ernest Hartmann. But one particularly striking facet of these models and insights is how vastly different many of them are from one another, even though they seek to answer essentially the same question: why do we dream? Meanwhile, additional views and theories about dreams keep appearing in various journals; but many of the authors behind these models—unlike the people mentioned above—appear to have little knowledge of, or appreciation for, the wealth of ideas and data that already exist in the field of dream research.

One could start with Francis Crick, the co-discoverer of the structure of DNA, who proposed that REM sleep dreaming served the function of "reverse learning," whereby the sleeping brain dreams to forget irrelevant information. Hence, according to Crick, the worst thing we can do is to try to remember our dreams! Of course, even a cursory examination of the literature would have revealed that high dream recallers are no worse off in terms of their well-being than people who rarely or never remember their dreams. And what are we to make of the idea put forth by David Maurice, a professor of ocular physiology at Columbia-Presbyterian Medical Center? He argued that the rapid eye movements that characterize REM sleep, and by extension dreaming, evolved to protect the cornea by regularly stirring the liquid (aqueous humor) needed to oxygenate the cornea while we sleep with closed eyelids. Even some of the more recent, neuroscience-driven models of dream function (e.g., dreams exist to keep the visual cortex from going too long without activation; dreams, and especially dream bizarreness, serve to help our brains better generalize our day-to-day experiences) appear to miss the mark by neglecting to take into account—let alone explain—key features of dreams and dreaming, such as why social interactions are omnipresent in dreams, or why dreams rarely if ever feature true episodic memories, or why dreams—particularly late-morning home dreams and laboratory REM dreams—are much more likely to incorporate emotionally salient waking-life experiences and concerns than less emotional events. It is as if researchers from other fields, realizing that nobody really knows why we dream, decided to answer this age-old question but without taking into account the great many things that we *do* know about dreams.

To make things worse, many contemporary dream theories continue to a) treat dreaming (a subjective experience) and REM sleep (a physiologically defined state) as the same thing; b) view dreams as a singular state, thereby failing to address the many different kinds of dreams people can experience; and c) remain unaware of, or uninterested by, the

considerable body of work showing wide-ranging associations between people's waking life experiences and the content of their dreams.

Finally, there is an underappreciation of how dreams may tie into the ever-growing scientific literature on the central role that sleep plays in stabilizing, enhancing, integrating and even altering our memories (including emotional memories), thereby not only improving how we feel, but also how we go about making sense of our waking experiences and the world in which they unfold.

In our book *When Brains Dream: Exploring the Science and Mystery of Sleep* (2021), Robert Stickgold and I wrote that "For every two hours we spend awake, taking in new information, it appears as if the brain needs to shut down all of this input for an hour to make time to figure out *what it all means*." We draw on a range of clinical, experiential and scientific findings to argue that dreams play a key role in this "off-line" processing of information. Specifically, we propose that the ability to imagine and plan for the future is critical for several forms of sleep-dependent memory evolution (a process much more complex than memory consolidation) and, to do so, the sleeping brain *needs* to dream. Both in this book and in an upcoming research paper, we present a model of dream function that proposes that by dreaming, the brain creates conscious narratives that imagine and explore a host of possibilities in a way that other, non-conscious forms of sleep-dependent memory processing cannot. In other words, dreams are essential for a number of unique and highly specialized sleep-related functions.

In addition to incorporating recent findings from different fields, this model (called NEXTUP, for Network Exploration to Understand Possibilities) takes into account and seeks to explain key aspects of the *experience* of dreaming. For example, we outline how, especially in REM sleep, higher levels of the neurotransmitter acetylcholine, together with the cessation of release of norepinephrine, bias dream-related associative networks toward exploring novel, creative, and insightful associations to current waking experiences and concerns. We explain why the strange and unusual juxtaposition of content coming from different memory sources is exactly what the dreaming brain seeks to create and explore. We also suggest that the reduction or absence of serotonin during dreaming explains, in part, why our dreams so often *feel* important. We try to explain why the dreaming mind shows a clear preference for weaving waking concerns and experiences with emotional salience into ever-evolving dream narratives. We explore how sleep and dreams help strip peripheral details from emotional memories, how they integrate new memories with older, related memories, and how such processes allow us to extract gist and discovery of the *meaning* of these memories. And since the dreaming brain cannot access and incorporate complete episodic memories (i.e., memories of actual events in our lives), we argue that the associative exploration that takes place in dreams is linked to semantic and nondeclarative memories (i.e., memories related to general world knowledge and those acquired and used unconsciously, respectively), contributing to their metaphorical qualities. Finally, to our knowledge, NEXTUP is the first model to propose that dreaming serves different—albeit interrelated—functions across different stages of sleep.

At the heart of this model is the idea that when the brain dreams, it activates the neural networks that underlie both our sense of self and our conception of the world, thereby launching us into an immersive and ever-evolving inner journey. More important still, it is this dynamic interplay between you and your dream world that allows your dreaming brain to not only track how you react to the situations depicted in your dreams, but also to note how dream-world *itself* reacts to your ongoing thoughts, feelings, and actions in the dream. In essence, we think that one adaptive function of dreams, and especially of emotionally engaged narrative dreaming, lies in the brain's ability to imagine novel and creative possibilities within our dreams, to monitor our reactions to them while exploring how the dream relates to our past, and to use this information to better prepare us for an uncertain future.

As detailed in *When Brains Dream*, several predictions derived from NEXTUP are well-aligned with contemporary descriptions of the formal properties of dreams as well as their specific content. We also show

how this model can help us understand key characteristics of different kinds of dreams, from lucid dreams to typical dreams to nightmares, and how dreams facilitate creativity and why they can be a source of personal insight. Finally, through its neurocognitive and neurobiological underpinnings, we believe that this model can be extended to any other mammals (as well as newborns) that may experience some form of dreaming, creating a broader, multidimensional, and developmental conceptualization of dreams and their possible functions.

Is NEXTUP *the* theory of dream function? Not at all. It is but one of many attempts to understand and explain the how and why of dreams. I do hope, however, that this theory, which interweaves core ideas and findings from many other sleep and dream researchers, brings us a small step closer to a more complete and satisfying answer to that age-old question: Why *do* we dream?

Antonio Zadra is Professor of Psychology at the Université de Montréal and a researcher at the Hôpital du Sacré-Coeur's Center for Advanced Research in Sleep Medicine. Along with *When Brains Dream*, co-authored with Robert Stickgold, his books include *The Dreamkeepers* (2021), a novel blending sleep science with dream mythology.