

# The New Neuroscience of Sleep and Dreams

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## STORY AT-A-GLANCE

- › Dr. Rahul Jandial's 25 years as a neurosurgeon reveals that dreams are deeply connected to neurological functions, with brain imaging showing distinct patterns between waking and dreaming states
- › During sleep, your brain's executive network (prefrontal cortex) becomes less active while your imagination network dominates, allowing for emotionally intense and illogical dream experiences
- › Your brain remains highly active during sleep, with electrical patterns similar to wakefulness. This "paradoxical sleep" serves to maintain brain health and adaptability
- › Lucid dreaming, where people become aware they're dreaming, has been scientifically validated through brain scans and even enabled researcher-dreamer communication through eye movements
- › Dreams with lingering emotional effects are particularly worthy of reflection, as they provide unique insights into your subconscious mind and waking life experiences

In the video above, Dr. Rahul Jandial, a neurosurgeon and neurobiologist, explores the power of dreams, bridging the gap between your waking consciousness and the vivid landscapes of your nocturnal visions.<sup>1</sup> His insights not only challenge conventional perceptions but also offer a scientific framework to understand the profound impact of dreaming on your daily life.

With 25 years of experience as a brain surgeon, Jandial has witnessed firsthand the delicate interplay of neurons, emotions and the subconscious mind. Drawing from thousands of patient stories, he emphasizes how dreams are intertwined with neurological functions.

"Dreams that are altered, removing parts of brains and dreams that persist, dreams that can't be stopped," he notes,<sup>2</sup> highlighting the resilience and complexity of our dreaming minds. His transition from the operating room to the laboratory underscores the advancements in neuroscience, enabling a deeper understanding of dreams through exotic imaging and electrical measurements.

## **The Waking and Dreaming Brain – Two Sides of the Same Coin**

Jandial's presentation includes a compelling comparison between the waking and dreaming brain. "There's no way to talk about the dreaming brain unless we talk about the waking brain. It's inseparable from the knowledge of neuroscience," he asserts.<sup>3</sup> This interconnectedness is visualized through brain scans that reveal both similarities and stark differences in neural activation.

During wakefulness, the executive network, primarily located in your prefrontal cortex, dominates. This network is responsible for logic, calculation and task-oriented activities. However, in the dreaming state, this region becomes "dampened," leading to a reduction in logical processing.

Instead, the imagination network takes the forefront, allowing for the rich, often illogical narratives that characterize our dreams. This shift explains why dreams are fertile **grounds for creativity** and emotional exploration, unbound by the constraints of our waking logic.

## **The Electrifying Nature of Dreams**

Jandial paints a vivid picture of the brain as an "electrical garden" teeming with 100 billion neurons firing incessantly.<sup>4</sup> Even during sleep, your brain remains highly active,

challenging the archaic notion that it merely "hibernates."

"The patterns in certain stages of sleep are so active electrically, metabolically that they're similar to the patterns we have during waking," Jandial says.<sup>5</sup> This active state, known as paradoxical sleep, underscoring your brain's relentless pursuit of activity and connectivity.

This persistent activity is not without purpose. Jandial posits that dreaming serves as a fundamental process for maintaining your brain's health and adaptability, with distinct characteristics from wakefulness:<sup>6</sup>

*"The dreaming brain is hyper-emotional and the waking brain is hyper-executive-task-oriented. These are the two features of the waking brain and dreaming brain that we have to keep in mind. They are the same brain. They produce the same electricity. There's blood flow going all the time. There's no activation and deactivation really. There's just a modulation of shifts.*

*The waking brain is executive network pointing outward, relying on the prefrontal cortex more. The dreaming brain is less prefrontal cortex and to compensate a lot more emotion, so much emotion can happen in the dreaming brain that even if you tried to be as wild as you could with your waking brain, you couldn't match it. The top speed of emotion and visual dynamics in the dreaming brain exceed what is possible during the waking brain."*

While highlighting your brain's capacity to process emotions and visualize scenarios at an intensity unmatched during wakeful hours, this hyperactivity during dreaming facilitates your brain's ability to fine-tune itself, fostering creativity, problem-solving and emotional resilience.

## **Decoding Erotic Dreams Offers a Window Into Your Subconscious**

Among the myriad of dreams, erotic dreams hold a special place in Jandial's exploration. Contrary to popular belief, these dreams do not rely on physical stimulation or sensory input. "The sensations are just created by the imagination," he states, illustrating your

brain's remarkable ability to generate complex emotional and sensory experiences independently.<sup>7</sup>

Interestingly, erotic dreams often precede the actual development of sensual capabilities in individuals. This phenomenon suggests that dreams play a role in priming your brain for future experiences, a concept that bridges developmental biology and dream science. Moreover, the prevalence of infidelity themes in erotic dreams raises intriguing questions about the interplay between desire, societal norms and subconscious processing.

Understanding the architecture of sleep is pivotal to comprehending the dreaming process. Jandial introduces the concepts of sleep entry and sleep exit – transitional states that bridge the gap between wakefulness and sleep. These periods are important, as they represent moments where the boundaries between dreaming and waking blur, allowing for a seamless transition of consciousness.

Sleep paralysis, a phenomenon where your mind awakens before your body, often leads to intense experiences of terror and suffocation. Jandial offers a scientific explanation for these experiences, linking them to your brain's neurotransmitter fluctuations during sleep transitions.

"The feeling of suffocation is you're feeling panic of being locked in your brain," he explains, demystifying the age-old tales of goblins and demons that cultures worldwide have used to describe these nocturnal terrors.<sup>8</sup>

## **The Reality of Lucid Dreaming – Science Meets Consciousness**

Jandial's talk also covers lucid dreaming – the rare state where individuals become aware that they're dreaming and exert control over their dream narratives. Initially skeptical, Jandial was persuaded by scientific evidence demonstrating the real-time activation of the executive network in the brain during lucid dreams.

Studies involving medications like the Alzheimer's drug galantamine have shown a dose-dependent increase in lucid dreaming occurrences, providing tangible proof of its

biological underpinnings.

Furthermore, techniques involving eye movements in sleep labs have enabled researchers to communicate with lucid dreamers, confirming the authenticity of their conscious awareness within dreams. This research not only validates the existence of lucid dreaming but also opens avenues for harnessing its potential for creativity and self-exploration.

Jandial even explains the potential of dreams to predict future neurological conditions, particularly Parkinson's disease. Through observations in sleep laboratories, he discovered that patients who would later develop Parkinson's exhibited distinct dreaming patterns years before their diagnosis.

These precognitive dreams often involved intense physical movements that, paradoxically, were executed with fluidity in the dreaming state but translated to rigidity and impaired movements in waking life.

This phenomenon, known as paradoxical kinesia, serves as a harbinger of the brain's impending degeneration. "The dreams in that way reveal what will happen with the human brain – they predict what will happen," Jandial says, revealing implications of this discovery for early diagnosis and intervention.<sup>9</sup>

## **Interpreting Dreams Using a Multifaceted Approach**

Dream interpretation, a practice as old as humanity itself, takes on new dimensions with Jandial's scientific insights. He categorizes dreams into various types – genre dreams, universal dreams, nightmares and erotic dreams – each serving distinct functions in your subconscious processing.

While some dreams require no interpretation, such as those directly reflecting your waking anxieties, others offer deeper insights into your emotional and psychological states. For instance, expansive dreams experienced by terminally ill patients symbolize a predictable companion to their intense emotional journeys.

Junk dreams, characterized by random and seemingly meaningless imagery, serve as your brain's way of releasing unnecessary cognitive clutter. Jandial advises focusing on dreams with lingering emotional residues, as they offer valuable reflections on your life and mental state:<sup>10</sup>

*"The ones you have a lingering, long emotional residue with – to me those are the ones to reflect upon. Those are the ones to think about the next day because they may offer you an insight into your life and into your mind, into your waking life, that you simply couldn't get elsewhere. This is the therapist built in.*

*These are the portals to your subconscious – the emotional dreams that happen in the dreaming brain and the occasional memory and the residue that lingers with you as you wake up."*

## **The Complexities of Sleep Disorders, Dreams and Technology**

The Q&A session following Jandial's presentation explored practical concerns about sleep and dreams. Addressing questions on insomnia, night terrors and neurodiversity, he reiterated the brain-centric nature of sleep. "**Sleep is for the brain**," he affirms, dispelling myths that attribute sleep solely to bodily rest.<sup>11</sup>

For individuals experiencing night terrors and sleepwalking, Jandial acknowledges the lack of definitive treatments but offers hope through understanding the underlying neurological mechanisms. By recognizing these disorders as manifestations of your dreaming brain's wildness, patients better navigate their experiences and seek appropriate interventions.

In an era where technology is rapidly advancing, Jandial also pondered the intersection of dreams and artificial intelligence (AI). While acknowledging technologies like Neuralink and large language models, he maintains a critical perspective on the feasibility of translating dream patterns into digital formats.

"Dreaming is divergent," he explains, contrasting it with the predictive nature of computer algorithms.<sup>12</sup> For AI to emulate the adaptability of the human brain, it would

need to incorporate a form of dream-like noise to prevent overfitting — a challenge that remains largely unresolved.

Nonetheless, Jandial remains optimistic about the future of integrating dream science with technological innovation, envisioning a symbiotic relationship that enhances both human cognition and artificial intelligence.

## The Ever-Present Dreaming Process

Jandial also emphasized the inevitability and necessity of dreaming. "The dreaming process of liberating emotion, liberating movement, liberating vision is happening every night," he asserts, "Our memory of it, by design I think, is meant to be minimal so we don't have dreaming and waking life confusion."<sup>13</sup>

He likens the process to the brain's way of keeping itself fine-tuned and adaptable. Whether through sleep entry and exit or the constant toggling between your imagination and executive networks, dreams are integral to your cognitive and emotional well-being.

He encourages individuals to engage actively with their dreams through dream journals, lucid dreaming techniques and mindful reflection. By doing so, you harness the full potential of your dreaming mind, unlocking insights that transcend the limitations of your waking consciousness.

Dreams are not mere byproducts of sleep but essential processes that shape your creativity, emotional resilience and even your future neurological health. In embracing the insights shared by Jandial, you foster a deeper appreciation for your dreaming mind — a place where science meets mystery, and where your innermost self finds expression in the silent narratives of the night.

## Sources and References

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