

# To Sleep, Perchance to Dream...and Tell

by Ellen Krall | April 2021

Why do we [dream](#)? What forces determine the content of our dreams? How do dreams arise in the [brain](#)? Humans have been fascinated by dreams for millennia, but these questions remain unanswered. Dreams are hard to study; researchers cannot simply peer into another person's dreams. Instead, they rely on individuals' own accounts of their dreams, and these accounts are usually fragmented and incomplete. In fact, most people forget their dreams as soon as they wake up. Our forgetfulness makes it difficult to study dream content and limits the scope of dream research. After all, how can researchers ask questions about our dreams if we cannot even remember them ourselves?



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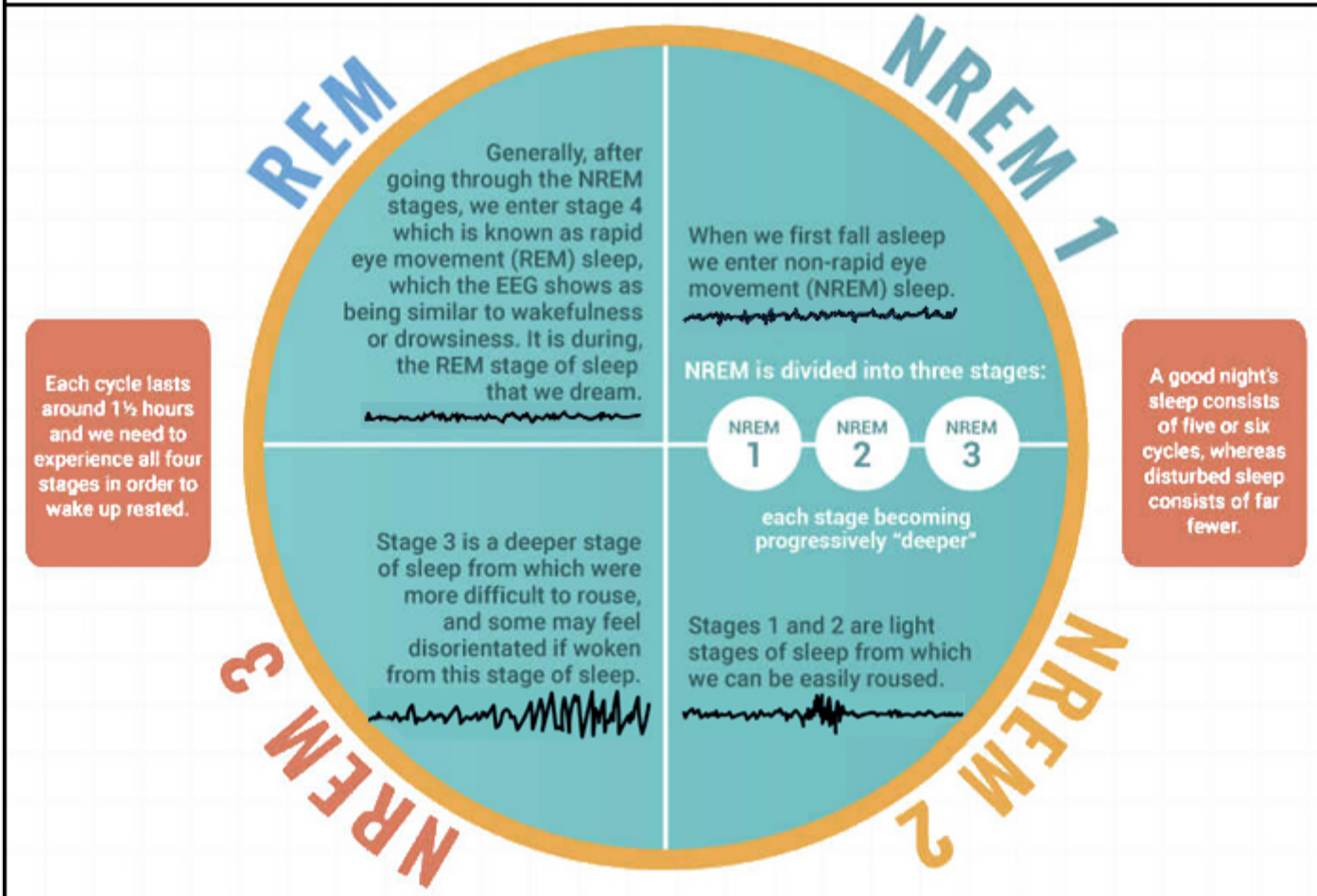
One solution to this conundrum is for researchers to communicate with people while they are dreaming. This may seem outlandish, but a study published recently in the [Current Biology](#) [takes essentially just this approach](#). The researchers, led by Karen **Konkoly** from [Northwestern University](#), report that they communicated with dreamers in real time *as they were dreaming*. They asked novel questions verbally or with other stimuli to actively dreaming participants, and the participants indicated their responses with specific eye movements or facial contractions. These interactions were rare but replicable, suggesting that Konkoly's work could represent a new method to interview individuals about their dreams.

## What Do We Know About Dreams?

Although there is no scientific consensus about why we dream, neurologists do agree about many biological aspects of dreaming. For example, we know that dreaming primarily occurs during [rapid eye movement \(REM\) sleep](#). REM is a stage of [sleep](#) characterized by rapid eye movements, temporary [muscle paralysis](#), and increased brain activity compared to other stages of sleep. REM sleep is necessary for cognitive function and comprises up to 25% of adult sleep. The remaining stages of sleep are classified as [non-rapid eye movement \(NREM\) sleep](#), and although they are important for brain health, dreaming does not typically occur in these stages.



### The Sleep Cycle



Top: Olena Cherenko/Getty Images; Bottom: Dr. Jockers.com/M. Bank

Dreaming primarily occurs during rapid eye movement (REM) sleep. REM is a stage of sleep characterized by rapid eye movements, temporary muscle paralysis, and increased brain activity compared to other stages of sleep. REM sleep is necessary for cognitive function and comprises up to 25% of adult sleep. The remaining stages of sleep are classified as non-rapid eye movement (NREM) sleep, and although they are important for brain health, dreaming does not typically occur in these stages.

We also know that the brain emits specific electrical waves during REM sleep that are distinctive from conscious brain activity or NREM sleep. Researchers can capture brain activity using a method called **polysomnography (PSG)**, and use the captured information to classify what stage of sleep an individual is in at any given moment. PSG collects this information through carefully placed **electrodes** on the scalp and face which track an individual's electrical **brain waves**, facial muscle activity, and eye movements over time. In their study, **Konkoly** and her team utilized this method to collect information from their participants.

## A Dreamy Experiment

In their study, independent research teams from the United States, France, Germany, and the Netherlands tested if it was possible to communicate with dreamers as they slept. To increase their chances of communication, the researchers sought out individuals that reported a history of lucid dreaming. Unlike normal dreaming, lucid dreaming occurs when the individual gains awareness that they are dreaming. The researchers predicted that experienced lucid dreamers, because they are aware that they are dreaming, could answer their questions more readily.

## Dream Communication Experiment Schematic



Konkoly, Karen R., et al./*Current Biology*

Independent research teams from the United States, France, Germany, and the Netherlands tested if it was possible to communicate with dreamers as they slept. These teams used either visual, tactile, or auditory stimuli to ask dreaming participants a series of questions. All groups asked simple questions (often mathematical operations or yes-or-no style questions), but the method of asking questions varied.

These teams used either visual, tactile, or auditory stimuli to ask dreaming participants a series of questions. All groups asked simple questions (often mathematical operations or yes-or-no style questions), but the method of asking questions varied. Some research groups asked questions in softly spoken words while others used tapping, lights, or audible tones to ask questions through [Morse code](#). Participants answered questions with pre-determined facial muscle contractions or eye movements that were tracked via PSG. For example, in German trials, participants answered Morse code questions by moving their eyes to the left to signify a Morse code dot and to the right to signify a Morse code dash.

It is important to note that while the pre-determined response eye and facial movements are subtle to the naked eye, they are starkly different from normal eye and face movements that occur during sleep and easily distinguished by PSG. Also, participants were able to practice these movements before they fell asleep to ensure they performed them accurately.



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After PSG electrodes were placed on the participant's face and scalp, researchers allowed the participant to fall asleep and enter REM sleep. Once researchers verified the individual was in REM sleep using PSG data, they asked the participant if they were having a lucid dream. If the participant answered "yes" using the pre-established eye or facial movement, researchers moved into the questioning phase.

## Sleepy Interrogations

An experienced 35-year-old German lucid dreamer was asked by researchers using Morse code "4 minus 0" using flashing lights and they responded with four left-to-right eye movements, indicating the correct answer "4." One French participant, after indicating they were in a lucid dream, was asked a series of yes-or-no questions verbally by researchers. One such question was "Do you watch football?" They promptly responded "No" by furrowing their brow, a movement detected by PSG sensors. Another participant, a 26-year-old from the Netherlands never indicated that they were having a lucid dream, but nonetheless answered two out of five math problems correctly when asked by researchers with verbal and visual cues. Across all research sites and trials, researchers attempted two-way communication a total of 158 times, and participants correctly answered questions 18.4% of the time.

The work by **Konkoly** and her team gives some of the first instances of two-way communication with individuals that are actively dreaming. Although the dreamers only answered questions correctly around 20% of the time, Konkoly's work suggests that dream communication is effective and replicable. **Konkoly** hopes that her team's findings will be applied to answer other important questions about dreams including the most fundamental; why do we even dream at all?

## Discussion Questions

Konkoly's study consisted of several research groups from across the globe. What are some advantages to having several distinct groups contribute to the same study? What are some disadvantages or challenges?

**Konkoly** reported that out of all communication attempts, participants only answered questions correctly 18.4% of the time. They also report that the most common response was no response at all. They said 60.8% of participants fell into this category of "No response." What happened to the remaining 20.8% of trials? (Hint: there are two other possibilities.)

Are the results more convincing considering that the research groups used different methods to ask dreamers questions? Would it be better for all groups to use the exact same question and answer protocols? Why or why not?

Are you convinced that Konkoly's experiments will allow researchers to interview people about their dreams while they are having them? What other experiments or results would you like to see to support this work?

## Journal Abstracts and Articles

*(Researchers' own descriptions of their work, summary or full-text, on scientific journal websites.)*

**Konkoly**, Karen R., et al., Real-time dialogue between experimenters and dreamers during REM sleep. *Current Biology* (February 18, 2021) (accessed March 17, 2021):

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## Keywords

dreams, dreaming, sleep, rapid eye movement (REM) sleep, REM sleep, non-rapid eye movement (NREM) sleep, NREM sleep, polysomnography, Karen **Konkoly**