



ELECTRODES AND WIRES help create a glimpse of dreaming minds at Swansea University Sleep Lab during a recent study with researcher Michelle Carr.



Dream Weavers

NEW TECHNOLOGY IS TAKING RESEARCHERS — AND ADVERTISERS — INTO BARELY CHARTED TERRAIN: YOUR SLEEPING MIND.

In a not-so-distant future, when a burbling stream cascading down the Rocky Mountains appears in your dreams, you might be skeptical of who planted it there. While the notion of a corporation seeding dreams in the sleeping mind sounds like a science fiction plot, some consumers began taking the idea seriously in 2021.

That's when Molson Coors ran an online video touting its "targeted dream incubation" campaign. The premise of the project was to plant images of Coors beer into the dreams of



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SLEEP STUDIES have successfully influenced content in a dreamer's mind, while observing how their brain and body responds.

football fans before the 2021 Super Bowl. The company called it "the world's largest dream study." Some might call it a nightmare.

The documentary-style ad online, which featured respected sleep researcher Deirdre Barrett and a behind-the-scenes-glimpse of a Coors sleep study, mostly amounted to a marketing gimmick. (No research has been published based on the trial portrayed in the video.) But the science isn't so far-fetched. A small but intrepid group of scientists is refining high-tech methods of tinkering with dreams, a field called dream engineering. Multiple marketing studies are also openly testing ways to use sleep and dream-hacking to drive purchasing behavior, according to Adam Haar, a dream engineer at the MIT Media Lab who has conducted cutting-edge dream research. One report in 2021 by the American Marketing Association New York even revealed that out of some 400 marketers surveyed at U.S. firms, 77 percent of their companies aimed to deploy dream tech for advertising within three years.

This commercial pursuit, with Microsoft, Burger King and other big

names reportedly investing, has raised serious ethical concerns about the technology — serious enough that 38 dream researchers posted an open letter in June of 2021. “The potential for misuse of these technologies is as ominous as it is obvious,” they wrote.

However, Haar, who helped draft the letter, says the ethical lines here are blurry. While he agrees that peddling potentially addictive beverages to sleepers is ethically dubious at best, he doesn’t entirely discount commercial uses of these methods. “Who is to say that Duolingo [a popular language-learning app] shouldn’t incorporate dream incubation into their language-learning practices?” he says. He’s also willing to consider other ideas, such as Marvel Entertainment giving children Iron Man dreams. “I am not the ethical authority here just because I know the science,” he says.

Gratifying as it would be to find a reliable language-learning hack, plenty of people shudder at the possibility of corporate shills dropping in on their dreams. The reality, though, is that the applications of dream engineering remain broad and varied as the concept shakes up the field of sleep research.

FOR STARTERS, a team in Montreal recently deployed a virtual reality flying game in which volunteers wearing headsets soar through a landscape of mountains and tunnels. Then they slept. With only 15 minutes of VR flying, participants were more likely to dream of flying both during naps in the laboratory (a five-fold increase) and later that night at home (an eight-fold increase).

Meanwhile, researchers at the MIT Media Lab worked on technology that aims to influence



THE DORMIO glove (above) can sense when its wearer dozes off (below). It then shares audio cues to influence dream content.



dreams during the hypnagogic state, a semi-lucid sleep stage that occurs just as you nod off. A team led by Haar devised a high-tech glove, called Dormio, that attaches to the hand and senses subtle changes in muscle tone, heart rate, and skin conductance. These readings indicate when a person drifts into the first moments of light sleep. The device then gives an audio cue, like “fork” or “tree.” During testing, when the researchers prompted sleeping subjects with the word *tree*, 67 percent of the reports gathered once the sleepers were awake reported something about a tree, according to a 2020 study in *Consciousness and Cognition*.

As far as application, one researcher, Michelle Carr, recalls how she often experienced sleep paralysis while in high school. It was years later, while studying as an undergraduate, that she experienced her first lucid dream, a scenario in which the sleeper is aware they are dreaming. The sensation occurred just as Carr was waking up — or thought she was — and actually interfered with the onset of a paralysis episode. She eventually realized that lucid dreaming might be a way to help people with nightmares and similar sleep disorders. As a neuroscientist, she is now one of the pioneers taking advantage of recent technological innovations in the field. Her work incorporates virtual reality, sensory stimulation and other techniques to manipulate the content within sleeping minds in surreal ways. “It brings usefulness to why we study dreams,” says Carr.

Until recently, most researchers believed that dreams were almost impenetrable, says Tore Nielsen, director of the Dream and Nightmare



Laboratory at Montreal's Sacred Heart Hospital. Before the 1950s, when experts discovered rapid eye movement (REM) sleep, they generally thought that the mind shuts out all sensory input during dreaming — making it virtually impossible to control anything. However, when scientists learned they could communicate with lucid dreamers while they dreamt — a breakthrough made possible by technology that tracks eye movements during REM — a new frontier opened up.

Technologies, such as VR and those used by Dormio, have tapped “ways of getting through to the dreaming person and manipulating dreams,” Nielsen says. Suddenly, a state that was stubbornly resistant to intrusion is softening up and cooperating with researchers who are probing its secrets.

OTHER RESEARCHERS in this field are more tentative about the power to sculpt dreams, but optimistic about the insights of dream engineering. Jennifer Windt, a philosopher of mind and cognitive scientist at Monash University in Melbourne, Australia, says that despite some successes with new technologies, dreams are fairly resistant to manipulation. “We can kind of nudge [dreams] in a certain direction,” she says. “We probably can't strictly script them.”

On the other hand, dream engineering, she says, offers the potential to shed light on one of the most intractable problems in science and philosophy: consciousness. That's because of the way dreams access the mind, which, like the ocean, remains largely unexplored.

Scientists are learning that sleep is much closer to waking consciousness than we have traditionally thought, explains Windt. And the reverse is also true. “Wakefulness is actually much more dream-like and much more sleep-like than we would have thought,” says Windt, who studies mind-wandering as well as dreaming. The similarity is found not only in the subjective experiences of wakefulness and dreaming, but in actual neurological patterns observed during these states.

Studying dreams can also illuminate how various stages of sleep — and perhaps dreams — support memory consolidation and learning. We've known for decades that sleep is essential for memory consolidation, says Nielsen. But whether dreaming plays a role in the consolidation has remained an open question.

Still, the ethical concerns about this research may limit its growth. This Janus-faced aspect of the field played out in a 2014 study that presented sleepers with the reek of rotting fish combined with

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the smell of cigarettes to help them stop smoking. The technique was successful. After a single night of exposure to unpleasant odors during sleep, participants smoked significantly fewer cigarettes the following week. However, in a 2020 paper about the promise of dream engineering — which acknowledged the benefits of the 2014 smoking study — Carr, Haar and colleagues recognized that manipulating dreams could be applied to less noble pursuits, such as creating political bias or sexual attraction. And the potential harms aren't limited to nefarious schemes and sleazy advertising.

If dreams also play a role in processing memories or emotions, as many researchers believe they do, questions arise about whether it is wise to tinker with the realm at all. In reality, we can't know the consequences of disrupting them until we better understand the function of dreams. Windt acknowledges that this is a reasonable concern. If, as her research indicates, dreaming is similar to



WHILE ASLEEP, participants in a study at Swansea University signaled to researchers when they had entered into a lucid dream state.

waking states such as mind-wandering, then “in dream engineering, we're tampering with just a part of [the consciousness experience], but not all of it,” she says.

In the case of Coors, that means even if the company successfully weaves its iconic burbling streams into a sleeping mind, that may not generate just a beer craving. It might just as well conjure fear, anxiety, the smell of rotting fish or other unknown effects in the perplexing human mind. **Q**

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