

# Flying Dreams Stimulated by Targeted Movement and Sound: Art and Science in the Dream Hotel

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*We present Dream Hotel Room 1, a sculptural artwork by Carsten Höller (with Adam Haar Horowitz) that uses dream engineering techniques to induce flying dreams. Dreams of flying are an exceptional experience; even years after their occurrence, people report these remain some of the most meaningful and memorable dreams of their lives. Existing literature suggests that flying dreams are common in childhood and then become infrequent in adulthood, occurring in only about 1% of adult dreams. We aim to (a) induce flying dreams in an adult population using a custom-built robotic*

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Adam Haar Horowitz served as lead for investigation, methodology, and writing—original draft and contributed equally to software. Carsten Höller served as lead for funding acquisition and supervision. Dominik Hildebrand served as lead for software and served in a supporting role for conceptualization and methodology. Nicola Di Chio served as lead for project administration and served in a supporting role for software. Seth Riskin served in a supporting role for methodology, validation, and fabrication. Pattie Maes served in a supporting role for funding acquisition, methodology, resources, and supervision. Adam Haar Horowitz and Carsten Höller contributed equally to conceptualization. Adam Haar Horowitz, Carsten Höller, Michelle Carr, and Claudia Picard-Deland contributed equally to writing—review and editing. Carsten Höller and Nicola Di Chio contributed equally to methodology. Adam Haar Horowitz and Dominik Hildebrand contributed equally to project administration. Dominik Hildebrand and Nicola Di Chio contributed equally to validation.

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*bed, (b) probe their phenomenological correlates, and (c) open targeted dream incubation experiences up to a large public in an art museum setting. To our knowledge, this is a unique and novel approach where scientists collaborate with artists to incubate dreams with the priority being the joy of the incubated dream rather than a particular scientific hypothesis. In total, 353 museumgoers slept in the Dream Hotel Room 1 for either a 1 hr nap period or overnight; of these, 24 submitted voluntary dream reports, with 16 visitors (67%) reporting at least one dreamt experience of flight. This is higher than baseline frequencies in adult populations reported in prior literature. Participants reported visual, auditory, vestibular, and somatosensory flying dream content. These findings may facilitate the development of dream flight induction technologies, as well as novel artist–scientist collaboration methodologies across the brain sciences.*

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**Keywords:** flying dreams, dream engineering, targeted dream incubation, relational aesthetics, art and science

Dream Hotel Room 1 is a sculptural artwork that uses dream engineering techniques to guide the dreams of museum visitors, with the goal of incubating flying dreams. Flying dreams have inspired artists worldwide for centuries and are depicted in artworks from Michelangelo to Salvador Dalí to Pupunya Tula Aboriginal artists, to name just a few. For around 10% of people, the first dream they can recall ever having is a flying dream (Zadra & Stickgold, 2021). Even years after their occurrence, these remain some of the most meaningful and memorable dreams people report ever having (Busink & Kuiken, 1996). Yet, these overnight experiences are often lost with age; flying dreams are common in childhood, with 9.5% of participants reporting flying as their earliest dream theme, and then later in life become infrequent, occurring in only about 1% of adults' dreams (Nielsen, 2017; Picard-Deland et al., 2020; Schredl, 2011). The loss of these dreams is the end of a joyous experience; flying dreams have been largely associated with feelings of euphoria and ecstasy, and flying is the most commonly planned activity among experienced lucid dreamers (Hurd & Bulkeley, 2014; Schredl, 2018). Making flying dreams easily accessible to adults could bring joy and artistic inspiration as well as potential mental health benefits, as the emotional content of dreams has been shown to carry over into waking affect and stress levels (Mallett et al., 2022).

Past research offers potential methods for inducing flying dreams via sensory experiences during sleep. As early as 1937, Hoff and Pötzl found that inducing certain physical conditions that affect balance prior to sleep, such as nystagmus, could trigger flying sensations in dreams (Hoff, 1937). Similarly, a study by Baldridge (1966) demonstrated that raising or lowering the head of a hospital bed during sleep not only increased overall dream activity but also elicited imagery of falling and flying (Baldridge, 1966; Nozoe et al., 2020). Further, sleeping in a rocking hammock heightened gravity-related dream content, like flying or controlling spaceships while also making dreams more surreal (Leslie & Ogilvie, 1996). Collectively, these past studies point to sleep on a moving surface as a potential flying dream induction method.

Presleep experiences and intention setting can also contribute to the incubation of flying dreams. Increased access to air travel may have led to parallel increases in the prevalence of flying in dreams; one study of four cohorts that were surveyed over different decades found that flying dream prevalence increased positively

throughout the years from 1956 (6.2%) to 1970 (7.1%) to 1981 (8.2%) to 2000 (10.0%; Schredl & Piel, 2007). Some lucid dreamers find that their dream flights improve after closely observing birds, making flying experiences increasingly effortless (Picard-Deland et al., 2020). More recent research on dream engineering has shown that innovative technologies, such as wearables and interactive media, can increase the likelihood that a presleep stimulus shapes dream content (Carr et al., 2020). Exposure to visual media before sleep can incubate dream content, with the rates of stimulus-related incorporation ranging from 3% to 43% for rapid eye movement dream reports (Diushekeeva et al., 2024). Studies exploring the rates of dream incubation have employed video games and virtual reality tasks as stimuli, including Tetris (Stickgold et al., 2000), virtual reality mazes (Wamsley & Stickgold, 2019), and arcade skiing (Wamsley et al., 2010; Wamsley & Stickgold, 2019), with stimuli successfully appearing in the dreams of participants. More recently, scientists used virtual reality flying experiences with awake subjects to successfully incubate dreams of flight in the sleep laboratory and also at home up to 10 days later (Picard-Deland et al., 2020). These studies point to the importance of presleep stimuli for the incubation of flying dreams and the potential role of immersive experiences as dream incubations.

Recent work from the rapidly growing dream engineering field suggests that exposure to stimuli during sleep, rather than only presleep, can be an effective strategy for incubating dream content (Carr et al., 2020; A. H. Horowitz et al., 2023; Mallett et al., 2024). The technique of targeted dream incubation (TDI) has been shown to guide dreams toward specific topics by introducing auditory cues related to desired dream themes during N1 sleep (Haar Horowitz et al., 2018, 2020; A. H. Horowitz et al., 2022, 2023). TDI has been shown to be >90% effective at inducing specific dream content, both with and without wearable sleep sensors (Bellaiche et al., 2024; A. H. Horowitz et al., 2023; A. J. H. Horowitz, 2019). This allows for dream incubation without the cumbersome polysomnography setup that is typical of sleep labs and enables people without access to polysomnography to work on engineering dreams.

The collected research on dream engineering points to a field that is ripe with opportunities for the creation of extraordinary experiences in sleep. As these techniques begin to leave the laboratory, the choice of what sort of dreams to incubate—those which emphasize empathy, entertainment, spiritual connection, or creative inspiration—can be designed in collaboration with all kinds of interdisciplinary artists and inventors. The arts and humanities have an intimate historical connection with the symbolic, emotional, and subjective meanings of dreams across centuries as art has been a tool to depict, share, and even shape dreams (Bulkeley, 1994; Kelley, 2002; Wiseman & Watt, 2022). The ties between 20th-century dream science and contemporaneous art movements can hardly be overstated; psychoanalysis inspired abstract expressionism by offering inroads to the unconscious; Dream Theory helped create surrealism by pushing artists beyond the rational mind (Kandel, 2012; Park West Gallery, 2010). This newest 21st-century step forward in the science of dreams—with dream engineering tools for artists to actively work with specific dreams they choose—can change the way art is made, experienced, and expand what audience participation in artwork means. Arts and sciences have different ways of engaging the public, and parallel artistic and scientific approaches can demystify complex scientific concepts while also inspiring personal reflection in museum visitors. Importantly, artists are also equipped with a vocabulary to probe the ethical implications of dream science, as manipulation techniques become more sophisticated and widespread.

For all these reasons, the work of shaping and understanding dream phenomenology using dream engineering will benefit from interdisciplinarity. Our Dream Hotel Room 1 is an attempt at such interdisciplinary practice, as a collaboration of an artist trained in the sciences (Carsten Höller) with a dream scientist inspired by the arts (Adam Haar Horowitz). From the arts, we use tools from relational aesthetics including audience participation and cocreation, an interactive installation, an influential environment, and temporally dependent evolving art. We incorporate an ordinary, relatable activity—napping—into the artwork to lower the barrier for participation in contemporary art. We use an aesthetic which is simple and clean, shifting focus from the material object of the bed to the experience of particular dreams of flying. Together, these transform the audience from passive viewers into cocreators, allowing them to influence the final form of the piece with the generation of a dream experience that is an integral part of the artwork. Incorporating relevant cultural history, symbolism, and flying dream mythology above the bed we use the visual stimuli of a flying *Amanita muscaria* mushroom kinetic sculpture. This particular mushroom, known commonly as the fly agaric, is a potent hallucinogen that has been used in shamanic rituals and associated with visions of flight (Höller, 2011; Lee et al., 2018; Letcher, 2008). The fly agaric mushroom is so named because it has been known to induce experiences of flying in those who imbibe it, including in ritual use by the Sámi people of Lapland, and is widely associated with the legend of the flying sleigh of Santa Claus (Lowy, 1971; Michelot & Melendez-Howell, 2003). From dream science, we use combined techniques of a moving bed, presleep visual media, and auditory TDI to incubate flying dreams.

## Method

### Engineering

#### *Robotic Bed*

The hexapod robotic bed system was designed and constructed to allow precise and programmable control of bed movements across six degrees of freedom (Figure 1). The system consists of a hexapod platform mounted on six actuators, which can be controlled through a custom graphical user interface (GUI). This system enables dynamic motion, including tilting, rotation, and elevation adjustments, providing precise manipulation of the bed position for experimental purposes.

The bed frame, including the mattress platform, was mounted securely on the top platform of the hexapod. The entire assembly was designed to ensure structural stability during dynamic movements, with appropriate weight distribution to prevent mechanical stress on individual actuators. The hexapod bed was rigorously tested for load-bearing capacity and movement accuracy. Calibration of the position sensors was performed by moving the bed to known reference points and adjusting the sensor output accordingly.

For simple sleep tracking, an Android cellphone running the Sleep as Android (SaS) software application was placed on the bed with constant charge supplied. SaS has been used in past studies for a moderately accurate, extremely convenient form of sleep staging (Germain et al., 2023; Holfinger, 2023; Ong & Gillespie, 2016). SaS sleep staging was sent automatically to the software controlling the bed

**Figure 1**

*A View of the Hexapod Robotic Build of Dream Hotel Room 1 at Fondation Beyeler, Basel, Switzerland*



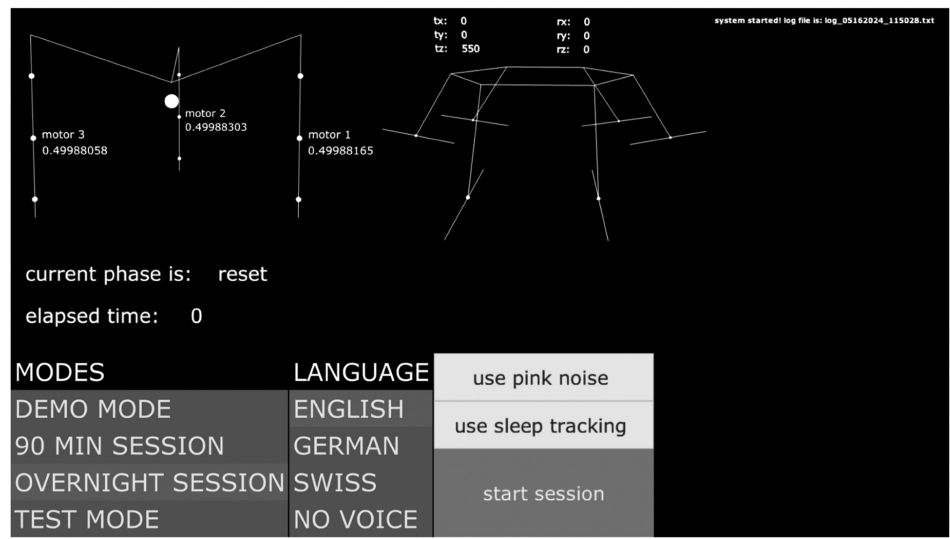
*Note.* Design by Carsten Höller and Adam Haar Horowitz. Engineering led by Nicola di Chio. Photographic image credit: Attilio Maranzano (2024).

movements, so that bed motion could be programmed based on detection of light sleep, deep sleep, or wake (Figure 2).

### ***Mushroom Mobile***

To design and engineer the suspended moving sculpture, a motor-driven pulley system was constructed using three evenly spaced motorized pulleys attached to the ceiling of a pitch-black room. The sculpture, naturalistically shaped and painted like a fly agaric (*A. muscaria*) mushroom, was lightweight yet sturdy, fabricated from durable polyurethane foam. Each pulley was equipped with precision-controlled cables, guided by a programmable stepper motor, to enable smooth, controlled motion in three dimensions across the room. A red light emitting diode light with a slit gobo was calibrated to project intermittent beams of red light to “slice” the mushroom replica, creating the illusion of the mushroom stretching, shrinking,

**Figure 2**  
*A View of the Custom GUI Built for the Robotic Bed*



*Note.* Design and engineering led by Dominik Hildebrand. GUI = graphical user interface. Photographic image credit: Adam Haar Horowitz (2024).

dividing, and flying mid-air. This setup was all controllable via the GUI described below, with the mobile’s movement speed easily adjustable to maximize the degree to which the mushroom’s silhouette appeared to morph dynamically in the dark (Figure 3).

**Software System**

A custom GUI was developed for intuitive control of the bed and mushroom sculpture’s movement. The GUI allows users, including museum staff, to manipulate the hexapod bed in real time or via preprogrammed sequences. Key features of the GUI include:

- **Variable motion sequences:** The bed was controlled by six oscillators for smooth movements in six degrees of freedom. Via the GUI, a museum attendant could change frequencies as well as amplitudes of movement. The current position is displayed onscreen for user reference. Automated rocking programs are stored for ease of use and automatically load at predefined time limits (i.e., Demo Mode, 90-min session). Importantly, movement patterns are always generated by the software in real time and do not repeat, making the movement difficult to habituate to.
- **Sleep tracking:** The GUI integrates the SaS signals of sleep stage automatically, using these tracked stages as triggers for bed movements and sound input.
- **Safety features:** The GUI includes an emergency stop button and software-defined movement limits to prevent mechanical overextension of the actuators.



**Figure 3***A Close Up of a Mushroom Mobile Prototype*

*Note.* Design led by Seth Riskin in collaboration with Adam Haar Horowitz, Suwan Kim, and Ganit Goldstein. Photographic image credit: Seth Riskin (2024).

- Actuator diagnostics: A real-time display of actuator status, including current position, load, and any error messages, is provided for debugging and maintenance purposes.
- Flying mushroom control: The movements of the flying mushroom can be controlled via GUI, with increases in speed available via toggle and present movement along a three-dimensional path stored for ease of use.
- Audio stimuli: The GUI enables switching between three languages (English, German, and Swiss-German) for dream incubation soundtracks (i.e., words spoken to sleepers) and further enables the use of pink noise to mask noise pollution present in the museum (Figure 2).

## TDI Methods

The Dream Hotel Room 1 was shown at the Fondation Beyeler Museum in Basel, Switzerland, during a group exhibition which was open to the public from May 19, 2024 to August 11, 2024. Museum visitors could reserve their spot in the Dream Bed online or in person for either a 1 = hr napping period anytime during daytime museum opening hours or an overnight period in the bed from 10 p.m. to 8 a.m. In total, 353 participants (all adults based on museum entry, age and sex not reported) napped or slept in

the bed over the course of the entire exhibition. When visitors arrived at the Dream Bed for a 1 hr nap, they were enclosed in a dark room with the red light slit illuminating the fly agaric replica. Upon lying down, they heard the “Pre Sleep Instructions” included below. When these instructions concluded, bed movement at  $\pm 1.5^\circ$  for 8 min began. When this movement concluded, participants were told to “Remember to think of flying with Fly Agaric mushrooms.” When sleep was detected by the SaS software, bed movement was initiated again at  $\pm 2.5^\circ$  for 5 min. At the conclusion of this movement, another audio file played “You can fall back asleep now. Remember to think of flying.” This process, reminding subjects to dream of flying and fall back asleep and then gently awakening them with another reminder, was repeated for the hour-long nap before visitors were awakened by a museum attendee. For the overnight sessions, the initial hour had the same prompting and movement as the 1 hr nap session and was then followed with a period of 4 hr of uninterrupted sleep. After this 4 hr period bed movement at  $\pm 1.5^\circ$  for 8 min began. When this movement concluded, participants were told to “Remember to think of flying with Fly Agaric mushrooms.” When sleep was detected by the SaS software, bed movement was initiated again at  $\pm 2.5^\circ$  for 5 min. A gap of 2 hr followed, after which the same bed movement and audio was initiated. Afterward, the visitors were awakened by a museum attendee. Attendees were told they could voluntarily report their dream by either (a) calling a posted number and leaving a voicemail or (b) scanning a quick response code and filling in a series of typed questions. Questions included: “Did you dream of flying during your time in bed?,” “Did you enjoy the experience?,” “Did you experience visual hallucinations (did you see anything you were thinking about)?,” “Did you experience auditory hallucinations (could you hear anything which was not in fact in the room)?”

Presleep instructions were:

Your dreams are products of your belief and expectations. To dream of flying, first you must expect you will dream of flying. You must intend to dream of flying, and feel this intention in your body, bring up specific images of the sensations of flight you intend to feel. When you lie down, repeat in your mind the mantra “I will dream of flying.” For thousands of years, intention setting just like this has been used for incubating specific dreams. We are using a new scientific technique, Targeted Dream Incubation, to enhance this dream incubation by helping you hover in the powerful liminal space between sleep and wake. Our system will deliver sound and movement at targeted times to bring you to a sleep state where brain chemistry is generating dreams but conscious control is not completely gone, so you can actively guide dream imagery towards flying. Our Targeted Dream Incubation technique has been shown to be 92% effective in studies at MIT. Believe in it. Enter our dreaming bed, lie down, and hold your specific image of flight in your mind. Flying with Fly Agaric mushrooms, around them, over them, pushing off of them, floating. Hold that image as you let drowsiness come over you. And do not worry if you are asleep. Dreams are what comes when your eyes close, whether you are drowsy, entirely unconscious, or in between. Inhabit this in between, drowsy mental space. Watch the edges of your mind for any images of flight, any seeds of images that your mind provides, and lean into the feeling of that image. Hold the reins of your mind lightly. And then let go.

## Results

### Flying Dream Incubation

In total, 353 museum visitors slept in the Dream Hotel Room 1 for either a 1 hr nap period or overnight; of these, 24 submitted voluntary dream reports, with 16/24 (67%) reporting at least one flying dream. Of these, 19 reports were submitted from naps and five from overnight experiences.



### *Experience Reports*

Public interest in dreams and enthusiasm about the Dream Bed was evident, as all reservations were booked up the first day it was on at the Fondation Beyeler website. Twenty-three of the 24 visitors reported that they enjoyed their experience (including six who did not dream of flying). Samples of responses to the question “Did you enjoy the experience” are shown in [Table 1](#). Only 17 of the 24 visitors who reported their dreams chose to then further elaborate on their experiences of visual or auditory hallucinations. Ten of the 17 reported experiencing visual hallucinations while in the Dream Bed (i.e., seeing things they were thinking about). Four of the 17 reported experiencing auditory hallucinations while in the Dream Bed (i.e., hearing things that were not in fact in the room). The examples of dream content and experiential reports are in [Tables 1–4](#).

### **Discussion**

Dream Hotel Room 1 is an interdisciplinary artwork that uses techniques from the science of dream engineering and the art movement of relational aesthetics. From the artistic toolkit, we make use of audience participation and cocreation, interactive installation, and temporally dependent evolving art; these aspects move the audience beyond being passive viewers, allowing them to influence the final form of the artwork by dreaming a dream that is an integral part of the artwork. From dream engineering, we use the combined techniques of vestibular stimulation via a moving bed, presleep visual media via a kinetic mushroom sculpture, and auditory TDI with a reminder to dream of flying. This combination of techniques—both across and within disciplines—is rare. In a dream science research project, the combination of many incubation techniques would represent a challenge in determining causality, and we can find no scientific articles that use such a multimodal paradigm. In an artistic space, the emphasis is on experience generated rather than post hoc understanding of mechanisms, which allows us the freedom to use any and all techniques that enable the creation of positive dream experiences.

Reports from visitors suggest that the combination of techniques was effective, as 67% (16/24) of participants reported at least one flying dream. This is higher than the baseline frequency of flying dreams in adult populations, around 1%, and we note that even if we consider those 16 flying dreams compared to the total sample (16/353 = 4.5%), this still represents an increase over baseline ([Nielsen, 2017](#); [Picard-Deland et al., 2020](#); [Schredl, 2011](#)). Twenty-three of the 24 (96%) visitors report their experience in the bed was enjoyable, with varied reports of interesting distortions of time perception, somatosensory gravity-related hallucinations, and dreams of flight they had not had since childhood. We see from elaborated reports ([Table 4](#)) that some participants had flying dreams continue even 1 month after their night sleeping in the Dream Hotel Room 1, that is,

Subsequently, I had countless flight-adjacent or weightlessness dreams—gliding in the air along miles of zip-line through a Swiss-looking city, floating in a pool with half my body supported on a floating sheet of glass ... Only now, a month and a half later, have the effects worn off and my dreams returned to normal. (Visitor 21)

There are a series of limitations on what we can conclude from participant reports. The 24 participants who report dreams voluntarily is clearly a very limited

**Table 1**  
*Dream Report Excerpts From Visitors Who Had Flying Dreams*

Visitor 10	Visitor 15	Visitor 19
<p>“I had a visual image of laying on the <b>mushroom</b>, flying as directed, with a sense of holding on—sort of like holding onto a dolphin’s fin while it swims through water. The gentle movement felt good and I put myself in ‘<b>flying mode</b>’. I don’t usually dream of flying so this was an interesting bodily feeling.”</p>	<p>“1. Seeing Icarus suspended in the sky above the sea—we were at the same height, meaning I was <b>suspended</b> as well. 2. Being Icarus myself—I could see my feather <b>wings</b> and could see the sea below me. 3. Being a <b>seagull</b> among other seagulls—always suspended and not really in motion.”</p>	<p>“<b>Floating</b> above the alps with the mountains to my back, with feathers sprouting on my shoulders and turning into <b>wings</b>. And <b>red fireworks</b> exploding in the night sky.”</p>
Visitor 2	Visitor 21	Visitor 20
<p>“At first: images of a riding a rollercoaster and then <b>taking off</b>, like a plane. Then sensations of <b>weightlessness</b> like when swimming in the water. Later the image of sitting on a big bird <b>flying</b> (a bit like the picture of Nils Holgersson). Then also the sensation of <b>flying</b> myself, very fast and upwards like a rocketship.”</p>	<p>“Everything is dark, but I am seeing things from my own eyes point of view. And it looks like I have a headlamp on because everything is bright only where I look. Things are in motion, blurring around me like I am <b>flying</b>. I am in a field of what I can best describe as those little leaves on top of a celery stalk, or maybe more so in the middle of the celery stalk. Because I can tell they are soft and young, like they haven’t fully developed. They are a little translucent and they are soft green and bright and shimmering. Big gusts of wind blow around the leaves that are bendable like grass, and are tossed around from left to right, swirling in unison, like hair blown by a dryer. Yet it is all in slow motion, slowed down. Everything moves in and out of vision like I am moving closer and farther away. And then I move through it <b>forward leaning</b> like I am running through a forest tunnel and the light green is shimmering all around me.”</p>	<p>“There was a hill that was completely covered with <b>mushrooms</b>, seen from an <b>aerial</b> point of view. Their caps were brown instead of red, but spotted, recalling the fly agaric, and they had bulbous rounded tops which were squished together as tight as tiles. I wasn’t in this dream but the view of it was from the <b>sky</b>, and above the hillside of mushrooms was lavender-colored fog through which the vantage point looked over everything. At the top of the hill, the <b>mushrooms</b> started to separate slightly, just enough to make out that they were no longer mushrooms, but rather very small and similarly round-shaped rabbits—hundreds of them. There was a woman at the bottom of the mushroom side of the hill, an elongated woman who looked to be from the turn of the last century, very Jungendstil, with a voluminous hat on top of a big chiffon hairdo, and a long white dress with an intricate lace blouse underneath. She was carrying a basket to pick <b>mushrooms</b>, not knowing they turned into rabbits, and was the first of a mushroom hunting party that I never saw the rest of. There was another brief dream where I was teaching my mother to walk a <b>tightrope</b>, like you sometimes see people doing between trees in the park. <b>Not flight</b>, but close to flight for an 81-year-old.”</p>

*Note.* Bold indicates dream content related to the presleep auditory and visual stimuli presented.

**Table 2**  
*Responses to the Question “Did You Enjoy the Experience” Given After Awakening*

Visitor 15	Visitor 14	Visitor 12	Visitor 7	Visitor 18
“Yes, I became a living piece of the art in the museum. Very aware of where I was in relation to the objects manifested by other people’s imagination.”	“I felt relaxed, as if I was floating in the darkness ... Before I fall asleep, I half-dreamed about something illusional, like floating plants in the sky, distorted English text in blue sky. The whole experience was very relaxing, I fall asleep sooner than I normally do. The darkness and floating bed give me immersive experience, the darkness makes me totally focus on myself, ignore everything else. I totally enjoyed the experience, it’s a whole different way to explore myself, and participate into art.”	“It was wonderful, and suddenly I thought, oh I am sleeping in a museum and had to laugh, the voice was very loud, she woke me up.”	“Much enjoyed the fairy tale state that the moving bed and flying mushroom physically evoked.”	“Yes I liked the fact of being part of the work itself and of being exhibited as part of the work.”

and biased sample, as it is likely those who had a flying dream were more motivated to voluntarily report their experiences. Further, as this was an art project presented in an art museum, the participants were not screened for sleep disorders or balanced demographically as a scientific sample would be. Third, the combination of dream incubation techniques makes any claims of causality difficult to determine. As such, we make no claims of statistical significance. We can report on the experiences of museum visitors and make no scientific claims or conclusions. As the Dream Hotel Room 1 is now in the collection of the LUMA Foundation, based out of Zurich Switzerland, we have an opportunity to continue to collect dreaming data and publish future studies on larger and more heterogeneous samples.

We hope these findings can facilitate new artist–scientist collaboration methodologies across the brain sciences. The incorporation of intentional, culturally relevant

**Table 3**  
*In Free Response Sections of the Postsleep Questionnaire, Visitors Reported Any Perceptual Distortions They Experienced*

Visitor 7	Visitor 10	Visitor 14	Visitor 15
“The impression the bed was moving even after it stopped.”	“Sometimes it felt like time was going by quickly and sometimes slowly.”	“After wake up, I feel my body is lighter, I feel like I walk on clouds.”	“Time became wholistic, not linear.”

**Table 4***Two Museum Visitors Wrote Multipage-Long Reports After Their Dream Bed Experiences*

Visitor 19	Visitor 21
<p>“The dreams. There is the preoccupation with light. The flashes of it. The glowing of celery leaves, shimmering velvet fabric, bright wood. There is the slow movement of it all. I don’t know if it felt like flying more so than being hoisted up by hundreds of invisible strings—like the mushroom wired above me was—and being carried to exactly the right place at the right time. By which all is to say: it felt heavy and like the air was water resisting me. I wasn’t light or free. I get very clearly where the stimulus of that room got taken and kaleidoscoped to produce the dreams that I had; and ALSO it feels like these were the only dreams that feel right to have come from that stimulus. I couldn’t have anticipated them before. But in hindsight it feels like there was only one place to arrive to that would have made any sense to me: a celery field, a red curtain, the holy chair.”</p> <p>“There was a way in which I knew I was awake, barely, throughout each of the dreams. Like the dreams were situated right above my head and if I just didn’t look them directly in the eye I wouldn’t spook them away. My whole body was like an immovable rock. Usually a restless, flailing sleeper, I stayed put. I know some lucid dreamers feel trapped in their bodies. I remember thinking about moving to test out if I could, but I didn’t want to disturb what I was seeing in the dream. I so badly wanted to stay still, and maybe pleasure isn’t exactly the right word ... but I felt huge satisfaction and comfort from remaining completely, completely immobile.”</p> <p>“At the same time, I know that I was, actually, asleep. Because I ‘woke up’ suddenly to the sound of a nice quiet Swiss man—the new museum minder there for his shift—saying ‘are you awake Grace ... are you awake Grace?’ I didn’t quite have the faculties to answer, but was aware that if I didn’t, he would come in and turn on the lights. And I said, to the best of my knowledge, ‘I am awake, Grace’ back to him.”</p> <p>“At twenty-three, a series of lucky interventions meant I was falling asleep again for the first time in my adult life; deeply enough to dream. The first few weeks—before it mellowed out to normal—was a paralyzing, unfurling force of dream life as my brain and body got a reminder of what it didn’t have access to, and dreamed urgently as if it were to again disappear ... All the vividness, the warp, the distortion of faces, and drama, and physically coursing emotions. It took me an hour to get out of bed.”</p> <p>“The dreams like that, the ones that bowled me over, lasted only a few weeks before my body calmed down, or got used to it. Something regulated, and now I sleep normally, and remember dreams infrequently. When I do, they are nothing to write home about. I think a dream</p>	<p>“And after I woke up in the morning and stayed in bed, the red light mushroom process started up again alongside some more discernible movements of the bed, and then I had a lot of visions—of floating on the sea surrounded by fly agarics the size of the one above the bed, of climbing inside the squishy stalk of a giant mushroom from the bottom and being engulfed in its gravity-less squishy innards, and even of being fully buffeted up from the ground on the wind as the bed was rocking. Not flight, but close.”</p> <p>“And ten days after the dream bed experience, for the first time ever and after years of trying, I dreamed about my pain condition—just that it existed, which it never did previously in my dreams. I was running, slapping my bare feet on the cement sidewalk, and could feel them burning with pain, as they often do in real life. In another, me and a herd of horses were swimming together deep underwater, but it was making my body hurt. Then, other nights, I dreamed of almost-answers to the mysterious question of what’s plaguing me—like an award show where a tuxedoed man was opening an envelope that would reveal what was wrong with me, but I woke up just before he read the note. In another dream, I got an answer—selenium, the word on my lips when I woke up—but I looked up selenium and can’t see any way this would relate to my condition. Only now, a month and a half later, have the effects worn off and my dreams returned to normal, but I hope to try the dream bed again, and maybe dream of a genuine answer to my problem after another of its dream-enhancing sessions.”</p> <p>“Just as fascinating for me though were the lingering effects of my night in the dream bed. Concentrating so hard on the experience of dreaming and having that guided experience had the effect of long lucid-dream training concentrated into a single night. Subsequently, I had countless flight-adjacent or weightlessness dreams—gliding in the air along miles of zip-line through a Swiss-looking city, floating in a pool with half my body supported on a floating sheet of glass, getting vertigo from looking out at the vast sky and landscape from the open 70th floor of a skyscraper.”</p>

*(table continues)*

Table 4 (continued)

Visitor 19	Visitor 21
to an insomniac will always be a gift; and these dreams in the dream bed in particular felt so special to receive (create? receive?). It brought me right back, for the first time since, to that month-long period of full color. I don't especially miss the intensity of those dreams, but I do miss how much they demanded my attention, forced it from me actually. The dream bed made me think that there is little that is ever as obvious as it is in a dream. I missed the feeling of waking up having seen something that I knew was essential, important, even if I didn't know why, and never will, like a holy, glowing chair."	

Note. Excerpts included here.

and symbolic visuals—that is, the fly agaric—is not prioritized in the sciences but is necessary in an artistic space. Flying dreams are a source of euphoria and ecstasy across cultures, researched far beyond the Western sciences and have played a significant role in varied religious and shamanic practice. The ability to fly in dreams in particular, and the attendant imagery of feathers, wings, and travel through worlds, has factored into Indigenous art and symbolized the power of shamans in many cultures (Nauwald, 2021). The fly agaric mushroom *A. muscaria*, and its reported hallucinatory effects, including experiences of flying, has been used in rituals and artworks by the Sámi people of Lapland, Zoroastrian priests of Mithras, the Anishinaabeg (Ojibwe) Indigenous Americans, and different Aboriginal groups of North-East Siberia (Lowy, 1971; Michelot & Melendez-Howell, 2003; Ruck, 2016, 2021; Wasson et al., 1978). The inclusion of such culturally relevant symbolism has a role to play in interdisciplinary and inclusive sciences going forward.

The novel methods that art offers to probe and shape experience broaden the possible questions we can ask in the cognitive sciences. This project's emphasis on the phenomenology of the incubated dream, rather than a particular scientific hypothesis, is a direct result of the collaboration between the artist and scientist. We hope this project can inspire more interdisciplinary development of dream incubation techniques and that these projects might carry mental health benefits via emotional continuity between dreams and waking affect (Mallett et al., 2022). We are also hopeful that artists can guide the dream engineering field toward more expansive research questions, and dream science can in turn provide tools for artists to make work that engages all levels of consciousness.

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