INTO THE DREAM LAB

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The New Science of Dreams and Nightmares

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For the days and nights of reverie in the
Dream and Nightmare Lab

I believe that the nightmare, far from being a failed or aberrant dream, is one of the most important kinds of dream, and the one in which we can most easily observe a process which probably occurs in all dreams. In this sense the nightmare is the most useful of dreams.

– Dr Ernest Hartmann

Contents

Introduction

It was just a dream.

Most people think of nightmares as something to forget about, to leave behind in the dark of night. Something we have no control over.

But pretty much all of us have bad dreams. We don't often talk about them, preferring to shrug them off in the morning light. But bad dreams are about much more than just a poor night's sleep, and understanding the impact – and surprising upside – to these dreams can help to soothe our restless nights and support healthy minds in waking life.

It's normal to recall bad dreams during periods of stress and, in some ways, it seems like these dreams help us to deal with difficult events from the day – what some scientists have described as 'overnight therapy'. Others see bad dreams as an evolutionary gain, a safe space where we can practise responding to potential real-life threatening scenarios. Most scientists agree that there is an upside to bad dreams, an advantage to facing these inner demons at night.

At the extreme, though, chronic nightmares can seep into our waking lives and be harmful to mental health.

As an example, in a sample of over fifteen thousand hospital workers, of those exposed to trauma, experiencing frequent nightmares was the single greatest risk factor for suicide.

Why is this? How can something so apparently illusory have such a grave impact on our psyche?

What most people don't realise is this: A nightmare is a real experience. It is real in our mind, in our brain, and in our body. For people who have faced significant trauma, or even those who are highly sensitive to stress, nightmares can in essence retraumatise an individual each time they occur. On top of this, frequent nightmares, and the disturbed sleep they cause, can interfere with our brain's ability to regulate emotion so we are left more defenceless the next day.

Luckily, modern dream science is drawing back the curtain on the dreaming mind, revealing what's going on inside after we turn off the lights. And cutting-edge research is giving us new ways to interface with our bodies and minds at rest, to influence these hidden worlds we inhabit when we sleep, and to stop the disruptive cycle of nightmares and restore a good night's slumber.

I'm a dream scientist. Over the past two decades I've spent hundreds of nights awake in the laboratory, watching people sleep. I watch their brain waves on the monitor, growing slower as they fall into deep sleep. Around every ninety minutes, the brain practically wakes up, and their eyes dart around as if watching a scene, or likely a vivid dream. I wake them lightly through the speaker: 'Can you tell me what you were dreaming about?'

Much of my work has focused on nightmares and what happens in the mind, brain and body when they occur. If someone has a nightmare in the lab, we might see their heart racing, their breathing becoming erratic and their brain activity fast and prone to waking. Their minds and bodies are convinced that the fear is real. And in many ways, it is. The real stress of nightmares often spills into waking life, with harmful repercussions, especially to mental health. Thus, their study and treatment are vital areas of research.

There are three main questions at the heart of my work: Why do we dream? Why do dreams go bad? And how can we harness the science of dreams and nightmares to improve our health? In this book, you'll learn about the evolutionary mechanisms behind the purpose of dreaming. You'll learn about the science behind when things go wrong and the possibilities that understanding nightmares offers. And you'll learn how to use dreams in your own life, either therapeutically or just for fun – and even how to lucid dream, too.

To study nightmares in the dream lab, we place various sensors on our sleeping subjects: Electrodes on the scalp measure brain activity to allow us to determine sleep stages; electrodes on the body measure heart rate and muscle tension, including two above the eyebrow – if you notice someone frowning during sleep, they could be experiencing a nightmare. An infrared camera projects a video of the sleeper into the control room, so experimenters can observe them over the course of the night. Periodically throughout sleep, we wake people up to recount their dreams.

While it's common knowledge that we spend a good portion of our lives asleep – eight hours each night, or a third of each day – what most people don't realise is that a lot of our time in sleep is spent dreaming. When I wake subjects repeatedly throughout the night – from the first moments of sleep onset through the depths of deep sleep and into the light hours of morning – in most cases they can remember that just before awakening they were experiencing something – thinking, feeling, dreaming something. Their sleeping mind is remarkably active; it slumbers but does not cease.

The content of these dreams varies across the night, at times more mundane and thought-like, at others more elaborate and dreamlike. In a way, this is similar to how your thoughts change as you go about your daily life: mind-wandering while doing the dishes or commuting to work, mind-focused while conversing with a friend or putting together a bookshelf. The varied inner experiences we have make up the phenomenal quality of our life – both while waking and while sleeping – and even define our mental health over time. It's not just the behaviours or tasks of the day that dictate our well-being, or even the state of our biology. Our inner experience of life is vital to our health and, as we'll soon see, how well we sleep at night.

The mind that you carry into sleep matters. We continue to have mental experiences across the night – thoughts and feelings, sensory impressions and emotions – and this activity of the sleeping mind is directly tied to our health. When dreams are agitated and distressing, they fill the body with real stress that spills over into waking life. And the disruption of sleep by nightmares wears down the

brain's defences and makes us more vulnerable the next day; this can lead to an inescapable downward spiral as this distressed mental state is carried into dreaming and back out of it again.

So while the past few decades have firmly established the importance of sleep for all facets of waking health, it has become increasingly clear that dreaming, too, impacts not only the quality of our sleep but also how well we feel and perform each day. Dreams are consequential. How we think, feel and behave in the hidden lives of our sleeping mind – it counts.

You may be wondering, what can we actually do about any of this? Most people hardly hope to exert any kind of control over their dreams. In fact, this belief that we *cannot* control our dreams is so widely entrenched that even people suffering from debilitating nightmares rarely, if ever, seek treatment.

But new understanding of dreams and nightmares says otherwise: As it turns out, we are not destined to accept whatever the night throws at us. Today, research is revealing that dreams are far more malleable and responsive to attention than you may have ever imagined, that we can to some extent engineer our dreams, shaping these inner worlds that seem so beyond our control. The purpose of this book, and of my research in general, is to help people engage purposefully with dreaming, to overcome nightmares, and to have more agency in how we go about our sleeping lives.

Before we get to precisely *how* we can engineer dreams, we must first explore why we dream in the first place. How

do our brains and bodies produce and respond to these nightly visions? What are the evolutionary functions of dreams? And what goes wrong in the case of nightmares?

To begin with, we can think of dreaming as a learned behaviour. We learn how to dream as individuals over the course of our lives; we develop personal dream habits and tend to have our own recurring dream themes. We have also learned how to dream as a species. Research has uncovered the same universal themes reappearing in dreams across cultures, suggesting certain dream features have evolved by design, in some way helping us to survive as a species over the course of history.

We also learn *from* our dreams. We might learn how to react when faced with a fear: Do we run and hide? Do we succumb to or overcome a given threat? When caught in a conflict, do we trust other people? Do we turn towards them or away? Dreams like these seem to prime our behaviours the next day, perhaps rousing intimacy or inciting jealousy, or generally affecting our mood. The mind learns from its trials during sleep and translates these lessons to waking life.

And of course, dreams often reflect our waking concerns, what Freud called the 'day residue,'[1] where recent events become swiftly woven into dreams. Most scientists think this process is meaningful, not random – that a natural process of dreaming is to echo through salient moments of the day, helping us to organise our thoughts and worries and adjust to new challenges in life.

In some ways it seems like nightmares interrupt this process, that rather than sorting through the day's events fluently, the dream confronts an obstacle, an

insurmountable stress that leads to overwhelm and awakening. In our research we have found that the brains of nightmare sufferers are less able to manage – or regulate – negative emotions when faced with stress. This creates a vicious cycle, where the mind becomes overwhelmed by stress during the day, and this leads to nightmares that further disrupt sleep and cause more distress the next day.

These nightmares, like dreams, seem to be learned. They usually have recurring themes that can reappear over many years, decades even, when triggered by similar waking life events. And most nightmare sufferers feel helpless, unable to do anything about their bad dreams. But it is possible to treat nightmares, to learn new patterns of dreaming in their place. Many nightmare treatments use simple visualisation exercises during the day to work the imaginative muscles while awake, creating new positive themes for dreaming.

Another powerful tool to overcome nightmares is lucid dreaming, where you become aware that you are dreaming while still asleep and can rewrite negative dreams as they occur.

My own path to the science of dreaming began after I experienced my first ever lucid dream. In 2008, I was an undergraduate at the University of Rochester, working in a sleep lab and studying cognitive neuroscience – that mysterious link between the mind and brain. One morning I was struggling to rouse myself from a bad dream, and when I opened my eyes and groggily sat up, I saw that the rest of my body was still lying there asleep! I realised I was dreaming, and marvelled at how real it felt.

After I woke up, I was captivated by the experience.

How was the dreaming mind able to procure such a detailed living experience of the world, while the brain and body were deeply asleep? Over time and through personal experience, I learned that lucid dreaming can be used to overcome nightmares, and in the years since, I became especially interested in the neuroscience of nightmares and lucid dreams, and how we can use these dreams for good.

Today, I'm a professor of dream and nightmare neuroscience, and I direct a laboratory devoted to engineering dreams, to shaping these inner worlds in sleep. I see the waking world opening up to the science of dreams, through the sharpening lens of neurocognitive science, growing networks of laboratories devoted to the study of the sleeping mind, and increasing attention to nightmares in sleep and psychiatric medicine. With this momentum, I hope to shine a light on nightmares and to unveil the myriad techniques available to work with dreams and improve our health in turn.

In this book, we'll take a deep dive into the science behind nightmares and nightmare treatment, explore how to have lucid dreams, and discover new tools for dream engineering that are designed to interface directly with the sleeping mind.

In Part I we will encounter the science of dreaming, uncovering what types of memories, emotions and actions are reflected in dream content, and what functions they serve. We'll examine the peculiar scaffolds of the dream world and surf the waves of the sleeping brain, where patterns of electrical activity drive the generation of dreaming. We will also see that dreaming is not confined

to the brain; the content of dreams is linked to the sleeping body and even receptive to the outside world, sensing stimuli from the environment and absorbing these sensations into dreaming.

In Part II we will look at the experience of dreaming. What is it like to be in a dream? How do our feelings and sensations arise through dream content? We will also explore how dreams become amplified in the case of nightmares; how stress and trauma give rise to nightmares, and the consequences on health over time. At the same time, we will see that many people who are prone to nightmares are also highly sensitive, and that this can be valuable at times: nightmare sufferers tend to be highly perceptive, creative and empathetic. This is an often-overlooked upside to being nightmare-prone.

In Part III we will explore how to work with nightmares, first in waking visualisations and then in lucid dreams, to foster more healthy dreaming lives. We'll discover techniques for interfacing directly with dreams and nightmares as they occur. Our lab uses simple lights and sounds to pierce the veil of dreams and enhance lucidity, but others use audio prompts to direct sleep onset dreams, or odours to ameliorate dream quality. Dream engineers are learning to modulate the sleeping mind, to dampen negative emotions or interrupt the bodily stress of nightmares and thereby repair the quality of sleep.

Finally, in Part IV, we will see that even beyond nightmares, dreaming acts as a useful barometer for our sleep and mental health, and a valuable resource we can tap into for a healthier life. Dreaming offers a practical means for building social connection and empathy, harvesting

insight and creativity, and strengthening learning. I'll show you how to engage with your dreams through dreamwork, lucid dreaming and dream engineering, and explain how these practices can become vital components to building a healthier sleeping and waking life.

In the end, I hope to bring you to a new understanding of how we experience sleep, why nightmares matter and what you can do to dream well tonight.

Part I

How Dreams Work

1

The Scaffolds of the Dream World

Anyone who has ever dreamed will know that many of the dreams we have are built on the scaffolding of our everyday life. Faces, places, or actions that we're familiar with pop up in our sleeping lives, along with concerns and affairs borrowed from waking reality: an argument or conversation, a regular commute, a movie we've just seen.

After many years of studying the neuroscience of dreams, reading thousands of dream reports collected in the laboratory or at home, through online surveys or in everyday conversation, one thing that has become clear to me is that there are certain patterns in dreaming – patterns underlying how our waking life is not only represented but *mis*represented in the sleeping mind. The dream has a unique, purposeful design: reflecting, yet transforming, our daily lives.

What we pay attention to while awake permeates where we journey in our dreams, with personal memories and culture filling in the scaffolds of the dream world. The sleeping self maintains a sense of identity, too, preoccupied by work, romance, survival. And the external world seeps into dreaming; this will come as no surprise to anyone who has slept through their alarm clock before,

the sound disguised as songbirds or disco-themed dreams. Indeed, the sleeping brain is not so cut off from the sensory world, the lights and sounds of the room around, as scientists once believed. All of these components together – our memories and preoccupations and the guise of the sleeping body – drive the design of dreams.

What are the idiosyncratic and, perhaps more telling, universal ways that we dream?

How dreams are designed

Over the course of my career, I've had the privilege of conducting dream science in a number of sleep laboratories around the world. The quintessential sleep lab is built on the same basic principles: a bed in a closed room, a two-way communication system, ideally a video monitor, and various recording equipment. This includes electrodes to measure brain activity and fluctuating heart rate, a small tube that splits into the nostrils to measure airflow, and various electrodes measuring twitches or tension in muscles or eye movements. Even more sensors can measure the position of the head and body, or the rising and falling of the chest, and a small microphone taped to the neck can record the slightest tickle of snoring in the throat. All of these subtle signals of the living body are collected in massive amounts of data over an eight-hour night of sleep.

Countless times I've invited subjects into the laboratory, and before they go to sleep I spend some time placing electrodes on their scalp and casually making small talk. I try keeping the lights low, offering some herbal tea, and

putting the subject at ease: the human element is essential to a good night's sleep.

Invariably, almost every subject asks me how I got into this work. It's a fair question – dream scientist is hardly a typical job title. And while I have always been fascinated by dreams, I must admit that I never thought I would be able to pursue a career in the science of dreaming. In a way, I stumbled into the field as an undergraduate at the University of Rochester. I had the opportunity to work in the Sleep and Neurophysiology Research Laboratory, located in the medical school a short jaunt away from the main campus. The sleep lab was tucked away in an old basement corner of the hospital, a hidden gateway to the unconscious mind.

It was there that I first learned about the electrophysiology of the sleeping brain – the waxing and waning patterns of electrical activity that occur as the brain descends through deeper and more active stages of sleep. While the science of sleep is, in its own right, a fascinating area of study, I was especially interested in dreaming, with entering and understanding that dark basement corner of our unconscious mind.

In Rochester, the bedrooms in the sleep lab were near luxurious, with large queen mattresses, thick warm duvets and art deco bedside lamps; artistic paintings of sleeping figures adorned the walls. The control room where we monitored subjects was set apart from the bedrooms, separated by a long hallway, a private bathroom, a kitchen and a lounge area. The biggest challenge for me was always staying awake all night while observing hypnotic brain waves on monitors, watching infrared videos of subjects' sleeping selves.

Having the control room separated from the bedrooms meant we could easily keep the lights on and talk or listen to music, while down the hall the bedrooms were near silent and pitch-black day or night – an ideal environment designed to be as conducive as possible for sleep.

In my current lab in Montreal, we have a more modest setup with two dorm-style bedrooms spotted with Ikea-like furniture. This kind of setting is in many ways familiar to our subjects, who are often students from local universities. The lab is one in a collective of sleep research set at the end of a fifth-floor hospital wing. Through a connecting doorway sits a sister sleep laboratory with three enclosed bedrooms, each with a private bathroom, where experimenters can control the lighting in the rooms to mock day-to-night phases of different lengths. Subjects sometimes spend multiple days in these time capsules, while experimenters observe how varying rhythms of light and life impact their sleep, relevant to night shift workers, blind individuals, and more.

Across the hall, the clinic diagnoses and treats patients with sleep apnoea, sleepwalking, narcolepsy and insomnia, to name a few, and our collaborations are revealing the many ways that dreaming, too, may be disrupted or treated in sleep disorders. Overall, the sleep centre is a lively setting, and the lights and sounds around sometimes leak into our subjects' dreams: from the labyrinth of fluorescent corridors on one side, to the windows outside on the other (think industrial Canadian snow removal over many nights each winter). Still, with a warm blanket, a dark room and muffled sounds from the outdoors, our subjects often drift readily into slumber.

Sometimes, as I sit in the control room monitoring another subject, perhaps with a fellow dream researcher, I think back to the many other labs I've worked in. During my first post-doctoral research position in the UK, for example, we had a simple lab space with two comfy bedrooms and in a makeshift manner we adapted baby monitors into a two-way communication system. The lab was set in the centre of an accessible college campus, near a beautiful coastal shoreline where subjects' dreams were sometimes startled awake by seagulls in the mornings.

In Chicago, Cambridge, and the Netherlands, the bedrooms were fashioned from pre-existing labs devoted to waking neuroscience, refitted with pull-out futons or couches to enable sleep studies. One of the bedrooms I conducted research from was tucked inside an old faraday cage, a room with a heavy metal refrigerator-looking door that isolates the subject inside an experimental chamber. Other studies in sleep clinics featured hospital-grade plastic beds and thin woven blankets, detracting from the comforting feeling so precious to sleep.

Suffice it to say, dreaming in a sleep lab can be far from perfect, and yet in my experience it has been endlessly revealing.

The most striking thing I've noticed across so many different studies, in different laboratories and countries, is that, despite the varied surroundings and comfort levels and ambient noise, there have been unexpected similarities in my subjects' dreams. Of course, while the basic sleeping environments are designed to be comparable to a regular sleeping experience at home, the unusual pressure

of needing to sleep and dream well for the experiment is omnipresent. It's perhaps not surprising, then, that almost half of our subjects dream about the experiment itself.

From back in the control room, as soon as I see a subject enter REM sleep – with the characteristic rapid eye movements that define the sleep stage – I try to imagine what they might be dreaming. I wait five to ten minutes for their brain and muscle activity to ramp up, then grab my microphone and carefully, gently, call their name to ask, 'Can you tell me what was going through your mind before I called you?' I pause and wait, as they usually stir for a bit, and hmm and umm as they try to pick up the pieces of the dream that's just fallen away. In regular life, it's relatively unusual to be woken in this way, but the gentle interruption is precisely what gives us prime access to the dream's contents. I listen carefully to their halting words, as they strive to tell me everything they can remember. A dream:

> I see the wires on my face. There are hospital corridors that I hover backward through. The student researcher follows me and I want to escape her. Then I'm in the lab and my parents come into the room. I am annoyed, I only have minutes to fall asleep.

Or:

> I dreamed that the experiment was going on too long. I felt like I wasn't performing well enough on the sleep side. I remember wondering (in my dream) if you could possibly see my dreams through the electrodes and if you were going to find me weird.

Poring over a decade of studies set in Montreal, my team and I uncovered references to the lab and to the experiment scattered throughout hundreds of dream reports.[1] Subjects dreamed of the study setting, of the corridors of the hospital, and experimenters appearing as dream characters; they dreamed of their mission to sleep well and to remember a dream, of objects like electrodes or computers or clipboards; and finally general sleep-related themes such as wearing pyjamas or seeing a bedframe. Though several of these study elements often appeared together, dreams never re-enacted the presleep laboratory episode in full. And this is a fact of dreaming: fragments of recent experience are often woven into dreams and combined with other memories to create a novel story, but single memories are almost never replayed in their entirety. One exception to this is the special case of nightmares, where traumatic memories are re-created in part or in full, but this represents a breakdown in the normal process of dream creation – and we'll return to these cases later.

While the lab dreams we observe do vary considerably, there are several recurring features that appear across many different subjects, suggesting the presence of certain design pressures that shape the narratives of dreaming.

Dream scenes in the lab often included research personnel appearing alongside other characters, especially friends or family, who crop up as part of fictional social scenarios in the lab. In fact, there is nearly always a social element to dreaming. In home dreams, social situations occur in over 80 per cent of reports, and up to 25 per cent of characters are family members and 20 to 40 per cent are

friends. In studies conducted in the lab, research personnel appeared in over half of our lab-related dreams – these are virtual strangers who the subject has only just met. This brings us to our first key element of the scaffolding of dreams: dreams are consistently social in nature, encouraging dreamers to freshly re-engage with people, even strangers, from their waking lives.

This social design provides a helpful clue about one function of dreams themselves: that dreamed social simulations may have evolved to support our development as a social species.[2] That dreams are selectively social, that is, they overrepresent social elements of our waking lives, could serve a purpose in reinforcing social skills overnight, perhaps allowing us to test out interactions and their potential consequences during sleep.

Of course, visiting the sleep lab is not your typical social affair. Sleeping in the lab is unusually intimate, with an experimenter watching as a subject sleeps and recording their dreams. It's not entirely surprising, then, that subjects also dream of being observed and of wanting to perform well for the experimenter. This ties in to a second element of how dreams are designed: dreams are often performative in nature, fashioned around a theme of skill rehearsal or achievement. Lab dreams often incorporate the basic task of trying to sleep well and remember dreams, along with other experimental tasks, too.

One subject dreams:

> My mother was with me, we walked in a corridor into the testing room. [The experimenter] put electrolytes in my head to write the dreams directly on paper. I

> went to another corridor to do the second test ... we wanted to finish to get out of the laboratory.

Another reports:

> I was trying to fall asleep and not doing very well, because there was no real barrier between the bed and the researchers ... and at one point my bed was in fact outside. The researchers referred to my brain patterns as a 'Dante pattern'.

Though there's no such thing as a Dante pattern, the latter subject's dream of trying and trying to sleep and perform well, despite many obstacles, is very common in the lab. It seems that while awake we make note of certain challenges or tasks at hand, and once asleep we are again put in a simulation to try to achieve our goal. The dream is often repetitive or circular. This subject repeatedly tries to fall asleep, but one thing after another gets in the way; that subject is doing tests for the experiment, but after finishing one test a second comes up.

In dreams collected at home, we witness similar themes of perpetually attempting (and often failing) to achieve a goal, like trying interminably to catch a bus or to get to the airport, endlessly looking for an object or outfit, under-preparing or arriving too late for an exam. These dreams seem to be goal-oriented and, like in the lab, they seem to be more about trying rather than succeeding, dreams of process rather than completion.

Beyond simply reflecting desired goals, research and perhaps common sense tell us that dreaming enables

nightly rehearsal in useful skills and that this repetition may be key to learning. While asleep we can practise using our dream bodies, to manoeuvre dream objects and navigate dream worlds. For instance, athletes and musicians dream of practising their particular sport or instrument, sometimes in high-pressure dreams of performance. If our lab dreams are any indication, another skill commonly enacted by the dreaming mind is that dreams are often exploratory – we are seeking, searching, probing through an unfolding map of the world.

Consider the following:

> The researcher came into the room, turned on the light, and another person came to talk to me. She cared for conscious people in dreams. The bedroom had another door with a corridor, and there were people in white uniforms at the end of this corridor in a room.

Another example:

> The experimenter comes into the bedroom. I see in front of me, where there should be a wall, a door. The door is opened by Jim from *The Office*. I see on the other side of the door a small corridor, and another open door. Jim tells me I can get up.

In these examples, dreamers imagine waking up in the lab and peering out into the expanding scene. The dream seems to reinstate a world that extends out from us spatially and temporally, like ripples of space and time. Some subjects even dream of making their way home from the

study, weaving through hospital corridors and traversing city streets. These dreams build on our ability to remember the recent past, including where we are and what we're doing, and project ourselves into possible near futures, a form of mental time travel with a hint of absurdity.

While some scientists quite fairly argue that dreams collected in the sleep lab might not represent natural dreams – that they're not the same as dreams collected at home – in my opinion they are still informative and useful, and they help flesh out the key pieces of scaffolding for the dream world. In fact, dreams collected from home and survey studies reflect similar themes to those collected in the sleep lab, fashioned around social simulation, skill rehearsal, exploration and reference to the current environment and ongoing concerns.

Another piece of the puzzle, so to speak, of how dreams are designed and built up comes in the form of 'typical' dream themes.[3] These are those dreams whose symbols or narratives are found repeatedly and with high prevalence across the population, and even across different cultures and ages. You have almost certainly experienced one or some of these typical dreams yourself. Upward of 70 per cent of people report experiencing the most typical dream themes like being chased, or falling, or trying again and again to do something. Over forty themes have been uncovered in survey studies, and many of them expand on the designs we've identified in lab dreams.

The social design of dreams, for instance, is evident in typical themes of being chased or pursued, bad dreams of infidelity or pleasurable erotic dreams, and

the semi-social dream of sensing a presence in the room. Other typical social dreams seem to cluster around concerns of self-consciousness or embarrassment. This seems to be the common thread to dreams of being inappropriately dressed or being nude, which resemble lab dreams of being observed by experimenters who are peering into the bedroom or recording subjects' private thoughts.

Other typical dream themes are more positive and exploratory, such as finding money or – my personal favourite – discovering new rooms or passages in your home. Sometimes, this dream plays out fantastically, like opening magical doors to another world. Other times, it's much simpler, like noticing a new closet in the hallway or a useful dishwasher in the kitchen (a good dream!). This theme is similar to lab dreams where unexpected windows, doorways and corridors keep appearing as subjects wander through the hospital setting. It seems like, rather than starting with a predetermined map, the dream world is continually created wherever the dreamer ventures, unlocking new spaces along the way and encouraging further exploration.

While typical dreams are so named because of how often they occur in the general population, it seems like each of us dreams a careful selection of themes that cluster around personal concerns. One person might recall frequent social dreams of embarrassment, like being naked in public; another person might have typical dreams of failure, of attempting to achieve a goal again and again without success. These dreams can take on a recurrent nature, repeating many times over many nights, and reappearing more frequently during times of stress. Up to 75

per cent of adults experience recurrent dreams like this, which can begin at a young age and persist for the rest of one's life. To give one example, the typical dream of missing an exam often begins during school years, when academic stress is at an all-time high; but this theme can recur for years, perhaps reappearing before a big presentation at work or an interview. Although the circumstances are different, the stress of performing well seems to trigger the familiar dream scenario.

While recurrent dreams are common to a large number of people, they seem to be more pathological than typical dreams; we'll return to recurrent dreams later, because they overlap quite a lot with nightmares.

Coming back to typical dreams, these universal themes reveal certain consistencies in dream formation across many people. Like lab dreams, they reveal a dream world that seems to be constructed around several purposeful designs – pressuring our dreams to be filled with characters to interact with, tasks to accomplish, avenues to explore. These themes point towards a sort of structural foundation to dream formation and provide clues to dream function itself, as we will continue to discover. At the same time, typical dreams are curious because they reappear in so many cultures and ages, and yet are often *not* experiences typical of waking life. When have you ever discovered a new room in your house, fallen or flown through space, or found yourself nude in public? And yet, a good deal of people will experience these dreams, possibly even recurrently.

What does this tell us about the design of the dream world? It's hard to argue, for the more unusual themes that

seem far removed from waking life, that they play a role in reinforcing specific skills, or even any relevant social practice. To understand a bit more about some of the more unusual and unexpected dream themes, things like teeth falling out or being unable to find a toilet, we'll have to look at another source of dream formation: the body itself.

The body's dreaming, too

It's not unusual to realise on waking that elements from our surroundings have found their way into our dreams: a barking dog, a car alarm, a chorus of birds, all transformed into the sounds and setting of the dream world as our brains try valiantly not to wake up. Needless to say, if the stimulus is too intense it will provoke an awakening, which is of course the basic principle of an alarm clock. But besides these morning interruptions, most of us consider sleep to be a time when we are cut off from the physical world, encased in our minds and insulated from our sensing bodies.

In actuality, dreaming is not so isolated from either the sleeping body or its sensory access to the world. Instead, there continues to be a flow of information through our senses, which is at times fluidly incorporated into dreams.

The influence of the body is perhaps most noticed in dreams at times when it's least desired: the urge to urinate, the inability to speak or move, grinding teeth or ringing ears invading the peaceful blanket of sleep. An extreme example of this comes in the form of sleep paralysis, where you are unable to speak or move in the moments before fully waking, often accompanied by frightening dreams.