7 The Subreality Machine in the Brain

A Most Remarkable Claim

In the last chapter we introduced a strange situation that could arise in our universe, the *Information-Limited Subreality*. But just because something is possible does not mean that it really exists. Descartes' evil genius, the brain in the vat, and the *Star Trek* episode are just fictional stories, scenarios that have never actually occurred. Now we want to turn our attention to something that does exist in our universe. The Inner Light Theory makes a most remarkable claim, *each of our minds is trapped within an Information-Limited Subreality*. Everything that we perceive and experience has been created for us by manipulating information. And the perpetrator of this act is none other than our own brain.

This chapter examines three pieces of evidence for this extraordinary assertion. First, we look at dreaming, our strange ability to enter another reality as we sleep. Second, we discuss a phenomenon called *change blindness*, and what it teaches us about our waking consciousness. Third, we compare the three realities that humans deal with, the physical universe, the dream state, and our waking consciousness. Looking ahead, in the next chapter we will examine how and why the brain creates this Information-Limited Subreality, outlining the evolutionary advantage of such neural activity.

The Lesson from Dreams

Look around and concentrate on what you experience. Perhaps it is a warm summer day and you are sitting on an outdoor patio. You see a deep blue sky and smell the fragrance

of the flowers in bloom. Wind blowing through the branches of a nearby tree provides a soothing melody. You feel the texture of this book in your hands, and can still taste the last sip of your beverage. Of course, your experience will be different; you may be in a university library, at your desk at work, or relaxing on the couch in your home. You may be smelling the fragrance of flowers, the sweetness of newly baked cookies, or the lingering odor of disinfectant. You undoubtedly will be experiencing many things from your five senses, plus an introspective view of your mind's operation. These are the things you perceive, and are therefore the things that define your reality.

But now imagine that you suddenly awake and realize it was only a dream. The things you had been experiencing can now be seen from an enlightened perspective. Before you awoke, you justifiably believed that the sights and sounds you experienced were genuine, originating in an external physical universe. The tree, book, and patio seemed more that just your perception of them; they were real objects with an independent existence. Or so you thought. But now that you are awake you have gained a greater knowledge, the knowledge that your previous reality was *not* genuine. The things that you had been perceiving exist only in your mind, and nowhere else.

The lesson here is extraordinary; *the world of our dreams is an Information-Limited Subreality*. By far, this is the single most important clue we have to unravel the nature of the mind. In previous chapters we have discussed three other examples of Information-Limited Subrealities, Descartes' evil genius, the brain in the vat, and The Inner Light episode. However, none of these three really exist; they are simply thought experiments used to explore what may be possible. But dreams are different; they do exist, and are a part of our daily lives.

To expand on this further, we will divide the functioning of the brain into two general parts, the **conscious** and the **unconscious**. The conscious portion is formed by those mental activities that we are aware of, such as our thoughts, feelings,

decisions, and control of our body movements. It is what we perceive by introspection on a moment-by-moment basis. In comparison, the unconscious portion consists of information processing that we are not aware of, but must be occurring somewhere within our brain. Of course, this is a very simplistic way of dividing up our mental activity. Nevertheless, it does match the general way we see ourselves from both introspection and the world of science, and is sufficient for our present discussion.

As an example, consider what happens when you encounter a picture of George Washington. Your conscious perception is one of immediate recognition. There seems to be no effort involved; the knowledge that "*this is George Washington*" simply enters your mind. But this is very deceptive; massive unconscious activity has taken place to carry out this task. For instance, the visual image from each eye must be segmented into regions of similar brightness, color, and texture. These segments must then be identified as facial parts, then as a face, and then as the face of the first American president. Of course, nearly all of these individual steps are hidden from your conscious examination; the end result simply appears in your conscious mind without apparent effort or action.

In our day-to-day lives we take this unconscious mental activity for granted. It is something we generally ignore unless we have a reason to examine it more closely. For instance, we might want to design a computer system that mimics its operation, or develop a medical treatment to prevent its loss to disease or injury. It is upon this closer examination that we find out just how complex and extensive this unconscious processing is. The unconscious is no less than the foundation of our minds; it is what consciousness is built upon.

The point is, dreams teach us an immensely important lesson about the interaction between the conscious and unconscious portions of our mind. So important, it becomes our fourth major teaching:

Major Teaching #4:
The Subreality Machine in the Brain

Our unconscious mental activity has the capability of placing our conscious mental activity in an Information-Limited Subreality. We know this for a fact; it is clearly demonstrated to us each night as we dream. It is undeniable that the machinery to accomplish this feat is present in each and every human brain. The nature and extent of this "subreality machine" remains for us to determine; but one fact is indisputable, *it is there.*

The Realness of Dreams

Our next step is to examine how realistic dreams seem to be, so that we can better understand the subreality machine creating them. Are dreams a vivid and detailed reality, or just a pale imitation of our wakening experience? Normal adults dream several times each night; however, very few of the episodes are remembered upon waking. It seems ironic that most of us know so little about something that occupies almost one-tenth of our entire lives. Do we dream in color? Can we feel pain in our dreams? Can a dream really fool you into thinking that you are awake?

Definitive answers to these questions come from **Lucid Dreams**.[1] This is the name given to dreams where the dreamer realizes that he is dreaming. This may have happened to you. For instance, you might witness something very strange or impossible, such as being able to breathe under water, or having Queen Victoria steal your clothes. You mumble to yourself, *this is weird, am I dreaming*? Suddenly you realize that you *are* dreaming, and that the reality you are experiencing is coming

1. Exploring the World of Lucid Dreaming, Stephen LaBerge and Howard Rheingold, 1991, Ballantine Books, 335 pages. Excellent overview of the topic, including tips for having lucid dreams.

from within yourself, not from an external physical world. As such, you are no longer bound by the physical laws of the universe, nor the dictates of social and moral responsibility. You might flap your arms and fly, run naked down main street, or gun down your enemies without mercy. And none of it matters in the least, because you know that it is only a dream. You experience a level of freedom that simply cannot occur in the waking world.

Lucid dreaming is a skill that can be learned, and some experienced individuals can invoke them almost every night. This makes lucid dreams a unique scientific tool for understanding the nature of our minds. The dreamer can carry out experiments within the dream, and report back his subjective observations when awake. For instance, the lucid dreamer might concentrate on distinguishing colors, recalling memorized facts, performing tasks such as mathematical calculations and reading, controlling the unfolding of events in the dream, and so on. This provides us with highly reliable data concerning the differences and similarities between our dream and waking states.

Researchers have even developed a way for lucid dreamers to communicate with the external world from within a dream. When a lucid dreamer rapidly moves his eyes back and forth in a dream, his physical eyes also move in this same manner. This provides a way for the dreamer to signal those in the waking world. For instance, it might be prearranged that the dreamer will use this signal when he begins some specified activity in the dream, such as reading or listening to music. When the scientists monitoring the dreamer detects this signal, they can study the corresponding neural activity occurring in the dreamer's brain.

In one classic experiment, it was prearranged for the dreamer to move his eyes back and forth once each second when he realized that he was dreaming. In the laboratory, the scientists watched the subject's physical eyes to see how fast they moved. This was to test the possibility that dreams occur

at an accelerated rate, where hours or days in the dream world might only require a few seconds or minutes in real life. The result? The subject's physical eyes moved back and forth once each second, showing that dream time occurs at the same rate as in the wakening world.

Lucid dreams have provided science with a good understanding of what we experience in the dream world. It is clear that our mental capabilities are limited in some ways during dreaming. For instance, the ability to use written language is very impaired, as is the transfer of information from short-term to long-term memory. It seems that some areas of the brain really are asleep during our dreams. But what is most important, dreams are as real to the dreamer as real life is to those who are awake. The subreality machine inside our brains creates a world that is nearly indistinguishable from our waking reality.

Let's look at an example to make this more concrete, the simple act of eating an apple for lunch. You see its bright red color and feel its smoothness against your fingers. It smells fruity; it crunches as you take a bite. The taste is sweet. You enjoy the sensations; they bring you pleasure and fill you with anticipation for the next bite. You think to yourself, *"This is a good apple*."

After you finish your snack, you go about your day's activities, and eventually fall asleep for the night. You begin to dream, and within this inner reality you encounter an apple. You see its bright red color and feel its smoothness against your fingers. It smells fruity; it crunches as you take a bite. The taste is sweet. You enjoy the sensations; they bring you pleasure and fill you with anticipation for the next bite. You think to yourself, *"This is a good apple*."

The point being, the introspective experience of the apple is the same in the dream world as it is when we are awake. However, in one case the experience is being generated by the unconscious activity of the brain, while in the other case it is derived from an external physical object. Of course, this kind

of deception is *possible* in our universe, as shown by the brain in the vat and other thought experiments. But just because something is possible does not explain why is should actually exist. Why should our brains have the capability to make us perceive an apple, when we are really in bed fast asleep? What possible purpose could this serve? Furthermore, how can the apple of our dreams be such a precise match to the apple of our waking world?

The Basic Premise of the Inner Light Theory

As we have shown, dreams are an Information-Limited Subreality created by the unconscious mental activity of our brains. This "subreality machine" is activated several times each night, providing a conscious experience that is identical to our waking world. The Inner Light theory takes this a step farther, asserting that this "subreality machine" is also activated during our waking hours, just as during our dreams. The unconscious processes that create our dream reality, also create our waking reality.

This is not to suggest that the external physical world is an illusion. On the contrary, when we are awake and perceive an apple, we have every reason to believe that the universe contains such an object. However, we do not, and cannot, experience the physical apple directly. The best we can do is to capture clues about the object's nature. These clues come in the form of light photons, sound waves, molecules of various chemicals, and mechanical interactions. These are the physical principles that underlie our five senses, resulting in neural signals being sent to the brain. These indirect clues are all we know about the physical universe, and the only things we *can* know about it.

But of course, our conscious perception of an apple is nothing like photons, sound waves, or neural activity. We see an apple as red, feel it as smooth, and taste it as sweet. This is our introspective experience, because this is the representation that the subreality machine has created for us. Our unconscious

mental processes fused the multitude of sensory data into the thing we recognize as an apple. Everything that we are conscious of has been created in this way. Our consciousness exists in this inner reality, not the physical world. When we are awake, the inner reality is constructed to mimic our external surroundings. When we dream, the inner reality exists on its own, without regard for anything outside of our brains. But either way, all we can consciously experience is the subreality created for us by our unconscious mental activity. The apple in our dreams seems the same as the apple in our waking world. And the reason why, *it is the same, exactly the same.*

What We See and Don't See

Dreams are overwhelming evidence that our unconscious mental activity can hold our conscious minds in an Information-Limited Subreality. But is there evidence that this subreality machine is also active when we are awake? The answer is yes; experiments show that the world we are conscious of is far more than can be explained by what enters our senses.

For instance, suppose you stand a few feet from the Mona Lisa, close your left eye, and stare at a fixed point in the center of the painting. Figure 7-1 illustrates the image that is detected by your right eye, and sent along the optic nerve to your brain. The gray filaments are regions where you are totally blind, a result of blood vessels in the retina blocking the detection of light. Likewise, the large rectangular region is where the optic nerve connects with the retina, where humans are also sightless. This is called the *blind spot*, and is really quite large, about the size of an apple at arm's length. As long as your eye remains fixed on the center of the painting, these gray regions are totally blocked from your gaze; you perceive nothing about the image in these areas.

When you first looked at Fig. 7-1, you probably wondered what the gray spider-like pattern represented. It probably struck you as quite odd and perhaps even a little creepy, like something out of a bad science fiction movie. It was totally

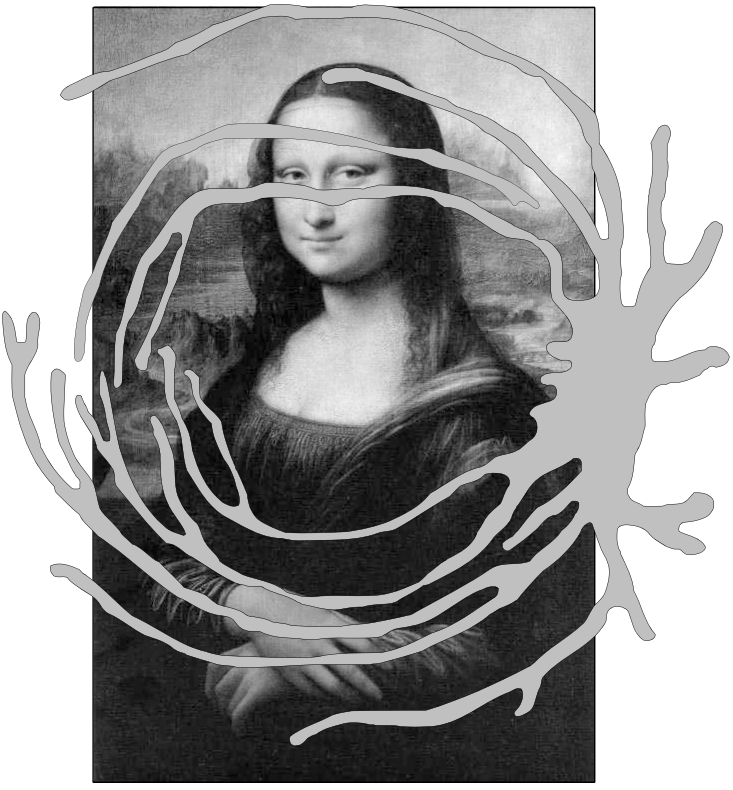

FIGURE 7-1
Blind areas of the eye. This represents what is seen by the right eye when standing a few feet from the Mona Lisa. The gray areas are where the eye is totally blind, a result of blood vessels and the optic nerve displaced sensory cells in the retina. The left eye has a similar patten, flipped left-for-right. How is it possible that humans are unfamiliar with these blind regions?

unfamiliar and foreign to your conscious experience. But how could this possibly be? This pattern has been superimposed on your visual field since you first opened your eyes as an infant. Even as you read this book the pattern is present. It should be more familiar to you than anything you have ever seen. How is it possible that our conscious experience knows nothing of these

blind areas? How can we perceive a complete and unbroken image when large portions of our visual field are blocked?

Experiments show that these blind areas are "filled in" by the brain to match their surroundings. For instance, Fig. 7-2 provides an experiment to demonstrate the blind spots in your own eyes. As indicated in the caption, when you gaze at the cross with your right eye, the circle seems to disappear. Likewise, when you look at the circle with your left eye, the cross cannot be seen. In both cases, the missing object seems to be replaced with the background grid pattern.

In other words, the image that we are conscious of seeing is composed of two sections, (1) areas that our eyes can directly observe, and (2) areas that have been filled in from neighboring regions. When we look at the world we believe that we are seeing a complete scene. It seems like a photograph, capturing all that is within our visual field. However, the "filling in" of the blind spot shows that at least some of what we see is being created by our brain. Further, studies of a phenomenon known as **change blindness** demonstrate that this is just the tip of the iceberg. As strange as it may seem, there is compelling evidence that much of what we seem to see is being generated from within ourselves, and is not a representation of the physical world.

In a typical change blindness experiment, a subject is asked to look at an everyday picture displayed on a computer monitor. For instance, it might show people eating in a restaurant, a sports activity, or several boats on a lake. After a few seconds the display is changed to a second picture, which is nearly identical to the first. The difference between the two pictures might be as subtle as changing the color of a chair or moving a vase, or as extensive as removing an entire mountain range in the background. The goal of the experiment is to have the subject identify what parts of the picture have been changed. The basic idea is that the subject will be able to detect changes in the things he or she is conscious of. Likewise, if the subject cannot discern when a particular thing is changed, we can infer

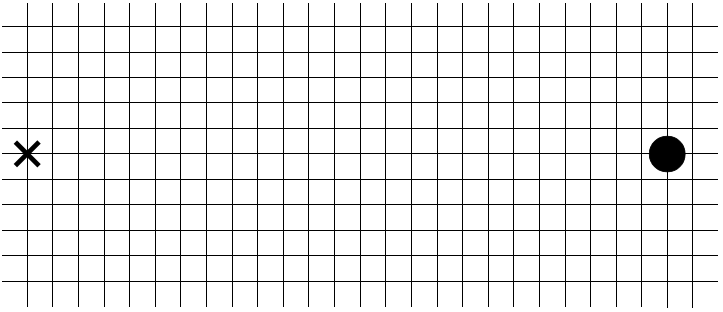

FIGURE 7-2
Demonstration of the blind spot. Hold the above illustration at normal reading distance and stare at the cross. As you close your left eye, the circle will be within the blind spot of your right eye and disappear from view. You may need to move the figure a few inches closer or farther than your normal reading distance to see this effect. The blind spot in your left eye can be demonstrated by staring at the circle and closing your right eye, making the cross disappear.

that they are not conscious of that particular thing. In most experiments, the two pictures are alternately displayed for a few seconds each, until the subject can identify the changing item.

Actual change blindness experiments are slightly more complicated than this explanation because the human visual system is extremely sensitive to *transients*. This is the technical name given to the temporary disruption caused when something is changed. For instance, imagine throwing a rock into a lake. The surface of the water is smooth before penetration, and is also smooth a short time after. However, the actual event is marked by waves and turbulence that takes a few seconds to subside. A similar process occurs in our visual systems when something is changed within our field of view. We have all had the experience of looking in one direction when suddenly we detect that something has changed off to the side. We don't know what it is, only that something is different from it was the instant before. In other words, we are not aware of the object itself, only the disruption caused by its insertion or removal.

FIGURE 7-3a
Change blindness images. The images in (a) and (b) are alternately displayed on a computer monitor for three seconds each. To mask the visual transients, a white screen is displayed between the two images for one-tenth of a second. Subjects typically require five exchanges before realizing that the background is changing.

Since our goal is to determine what we are consciously aware of, change blindness experiments must include a way to eliminate the ability of the visual system to detect transients. Fortunately, this is quite simple. In one technique, the pictures are changed when the subjects blink their eyes, or when they move their eyes from one location to another. In another method, a brief flash of light is inserted between the two pictures. Either way, the transient caused by the changing picture is hidden by a disruption of the entire visual field.

Figures 7-3a&b show typical pictures from a change blindness experiment. This is quite an extreme case, where

FIGURE 7-3b

almost one-quarter of the total image is changed between the two pictures. During testing, each of these images is alternately displayed on a computer monitor for three seconds, with a pure white image displayed between them for one-tenth of a second. The images are full color, good quality, and displayed on a large monitor. The question is, how long does it take subjects to realize that the background of the picture is changing?

Our subjective impression is that vision provides us an accurate and full representation of the physical world. We believe that there is a rigid one-to-one correspondence between what we see and what really exists. Accordingly, it seems that we would immediately notice such large changes as in these pictures. But this is not the case. It typically takes subjects five exchanges before they realize that the background of the picture is changing. For an average of fifteen seconds, the subjects

look at the alternating pictures and perceive a single scene. When finally found, the changes seem obvious, and the subjects are dismayed that it took them so long.

The results of change blindness experiments are surprising, to say the least. While it is easy to detect changes in the key elements of a picture, it is very difficult to detect when secondary aspects are changed. For instance, suppose the picture is of a couple eating lunch in a restaurant. The key elements are the man, woman, table, and perhaps the plates of food. These are the objects that define what the scene is about, the central features of the picture's meaning to us. As we would expect, subjects can immediately notice when these main portions of the picture are changed. However, secondary aspects of the picture, such as the paintings on the walls and the other diners in the background, can be dramatically changed without the subject noticing. Even if these secondary aspects are quite obvious in the image, subjects can require minutes of observation to detect when they are being changed.

When we are awake and looking around, our attention directs us to a few key elements in the visual field. However, we are also conscious of seeing secondary features in the visual field, a background that is of lessor importance. As disturbing as it may seem, these perceived secondary features have little or no connection to the external physical world; they are being generated from within ourselves.

Evidence from the Three Realities

In short, the argument is laid out like this. We know that our brains contain the machinery required to place our conscious activity in an Information-Limited Subreality. This is proven by our ability to dream. The assertion being made is that this same machinery is also activated when we are awake, and that we can be conscious of nothing but this inner reality. As evidence, experiments show that much of what we subjectively experience when we are awake does not come from the external world. For instance, we "see" regions in the visual

field where our eyes are completely blind, and make up secondary features in visual scenes. This is strong evidence that at least some aspects of the "subreality machine" are active when we are awake.

But there is a far more compelling argument that the subreality machine is fully switched on whenever we are conscious. This can be shown by examining the structure of the three different realities that humans deal with.

The first of these realities is the physical universe. This consists of all the things that scientists study, such as force fields, particles, distance, time, plus all the entities that can be created by combining them. This is the unfeeling and uncaring world that activates our sense organs, such things as light photons, sound waves, molecules of various chemicals, and mechanical interactions.

The second reality we must consider is that of our dreams. As we know, this reality is constructed by the unconscious activity of the brain, and has little or no correspondence to the structure of the physical universe. In fact, its characteristics are nothing like those of the physical universe. Rather, its Elements-of-reality are the entities that we discussed in Chapter 4, such as qualia, mental unity, semantic thought, present tense, and free-will. This is the reality where we see an apple as red and taste it as sweet, we feel love and anger, and experience our thoughts as having meaning.

The third reality to be examined is that of our normal waking consciousness, the reality you are experiencing at this very moment. The question is, where is this third reality coming from? Is it being generated by the subreality machine, or does it correspond to the external physical universe? The answer to this could not be more clear. The reality of our waking consciousness is virtually identical to the reality of our dreams, but is totally dissimilar to that of the physical world. In other words, reality three is the same as reality two, but completely different from reality one. The conclusion seems inescapable;

the subreality machine within us creates not only our dreams, but all of our conscious reality. This is our fifth major teaching:

Major Teaching #5:
The Origin of our Conscious Experience

All of our conscious experience is created by the subreality machine contained within our brains. When we are awake, this inner reality is constructed to mimic our external surroundings. When we dream, this inner reality exists on its own, without regard for anything outside of ourselves.

To be perfectly correct, we should say a few words about the statement: "*our consciousness exists within an Information-Limited Subreality*." In Chapter 6 we carefully defined the characteristics of the Information-Limited Subreality. One of these characteristics is that the inner observer is completely isolated from the external world, with no knowledge of it whatsoever. This is simply the definition we have chosen to use.

However, it is obvious that our conscious minds do know something of the external physical universe. When we are awake, our inner reality mimics the external world, allowing us to move our bodies in a productive manner. Even when we dream, our inner reality is structured in rough accordance to the external world, based on past waking experiences. For these reasons we cannot rigorously say that our consciousness exists within an "Information-Limited Subreality." A certain amount of information about the physical world leaks through to the inside. Accordingly, it might be more correct to say that consciousness exists within a "Leaky" Information-Limited Subreality," or some similar qualifier. However, we won't go to this extreme, and will continue to use the shorter phrase, opting for simplicity over strict formality.