

Patterns of Reality

You don't need your eyes to see. I don't mean that in some mystic, metaphoric sense. I mean that your eyes are not necessary to your ability to see. In fact, your eyes literally don't see at all.

Gripping this fact wasn't easy for me. It struck me as a bit of a mindbender, but I think I can explain it, and give you a reason to care about the explanation. I haven't seen this idea--that your eyes don't see--ever stated the way I've laid it out here. Instead, I built up the realization from other related concepts. Daniel J. Levitin's book *This Is Your Brain on Music* is what first nudged me onto this line of thought.

Levitin's book is about music, not vision, but his descriptions of the way your brain understands music resonated with me. It set the tone for a whole new way of viewing not only my body, but my humanity.

Consider that your sight is incidentally caused by stimulus to your eyes, but it is ultimately caused by the electrical activity in your brain. Your eyes are just an input device. They don't actually see anything -- *you* see things. You experience vision, not your eyes. What gives your brain the ability to provide you with the experience of sight is the electrical impulse it receives. It can receive these impulses from your eyes, or some other source, such as a hallucinogenic compound. Ask an acid tripper if it's necessary to see something with his eyes to have the *experience* of actually seeing it.

It goes much further than that, of course. In fact, I can explain how none of your body is necessary to your ability to have any of the rich sensory experiences you enjoy, including interaction with the real world. Your entire living body is as necessary, and as human, as a cheap prosthetic limb.

It may sound like I am speaking radically, and in a sense I am. There are profound and exciting implications bundled up in the consequences of recognizing, how shall I put it, the *incidental* quality of the body with which you were born. This can be explained, and demonstrated to your satisfaction, by starting with one simple statement:

You experience the world through your experiences.

Perhaps this seems like an observation not worth making, but I can show it is one of the keys to understanding our humanity. Let us consider a rose. Think of a red rose you have seen before, and place yourself in the position of seeing it again. The rose you see really did exist, but it was not really red.

No, not red in reality. It is certainly red in a kind of virtual reality, but not in reality. Redness is an experience generated by electrical activity in your brain. That electrical activity is in response to a stimulus -- the rose. The rose provokes that response by

being composed of a material that reflects light at a certain frequency. This light plays upon your eyes, and sparks a cascade of electrical activity in your brain, giving you the experience of redness. Levitin describes the act of hearing a note of music in much the same way.

The point here is that the redness of the rose is subjective -- not objective. The distinction is subtle but of monstrous importance. Let me show you. Think of a song you enjoy. Perhaps you have it on a CD. Go on, think of a particular one. We have time.

Now, let's say that you can play this song of yours on your scratchy stereo speakers, or on your high fidelity Dolby 5.1 surround sound home theatre. What the song sounds like is dependent on what machine represents it. That doesn't mean the song lacks an objective or coherent existence. It's the same song no matter what speaker set is playing it, the *song* doesn't change from speaker to speaker -- it's the speakers that change. The sameness of the song is its objective existence, but its representation on the speakers is its subjective existence.

Your eyes are like the speakers. Maybe you have high fidelity eyes that perceive richness and depth of redness in the rose. Maybe you have eyes that lack the ability to distinguish the color red, and you see a gray rose. Whatever the case, the rose is the same -- it is not gray when one person looks at it and red when you look at it. How the rose is experienced by you depends on what machine you use to represent it.

Let us consider in greater detail how your eyes come to represent that rose. The process can be described as a logical response called by your eyes: if X stimulus, then Y response. The X stimulus is a certain frequency of light waves falling on your eyes. The Y response is an electrical discharge, generated by the rods and cones in your eyes and carried along your nerves and into your brain. There, an array of neurons in your brain is electrically stimulated, resulting in the experience of redness.

That which gives you, your conscious self, the experience of seeing red is not ultimately your eyes -- it is the firing of an array of neurons in your brain. If one were to implant an electrode, either by nanobot or open brain surgery, that fired an electrical discharge which stimulated the same array of neurons, you would experience the same sensation of redness. To you, yourself, there would be no difference between what you see when your eyes stimulate your brain, or what you see when the implant stimulates your brain.

This is how your eyes are not fundamentally different from any other input device artificially connected to your brain. Indeed, your eyes aren't even necessary for you to see.

The simple truth of this claim is displayed in dreams, or any other hallucination¹. When you dream, your body becomes paralyzed by shutting off the connection between some of your brain's neural arrays and some of your body. Your brain both generates and

¹ <http://xkcd.com/203/>

receives electrical discharges, and experiences them as if they were real, even though your external body does not actually encounter a stimulus in reality.

Perhaps you dream you see a red rose. The same arrays of neurons that activate when you view a red rose in reality are activated when you dream of one -- even though your eyes are not seeing a red rose at the time of the dream.

It has long been thought that this was true, but research as reported by Dr. Itzhak Fried in the journal *Science*² has demonstrated it for a certainty. There is no longer any question that the act of imagining an image is identical to the act of really seeing that image in terms of electrical activity in the brain.

In other words, your eyes are incidental to your ability to see. When it comes to the subjective experience of sight, what matters is the electrical activity in your brain. That electrical activity is what gives you your experiences -- all of them.

The upshot of understanding that you experience the world through your experiences is that there's no reason to think of the experiences fed to your brain by your fleshy body as "more real" than ones fed to it by an implant. In fact, it makes more sense to view your own body as an implant itself.

With this understanding, we can see that it's not really accurate to say you see with your eyes. Your eyes are an input device wired to your brain, like virtual reality goggles, but your *experience* of sight is caused by the firing of neural arrays in your brain. If some other input device were wired to the neural arrays responsible for visual experience, you would have exactly the same experience of sight when that input device interacted with your brain.

This is not theoretical. Cochlear implants have been used to allow people who were born deaf to hear. Their ears do not work. The implant does not amplify sound like a hearing aid. The cochlear implant is a computer with a microphone that turns the sounds it detects into electrical impulses which are wired directly into the deaf person's nervous system. Thus, sounds the microphone picks up generate an electrical charge which activates neural arrays in the person's brain, causing them to have the experience of hearing.

This illustrates that the ears are logical response machines. They have simple rules with complex variables: if X then Y, where X is a sound and Y is an electrical impulse delivered to your brain. Ultimately, we will see that every part of your body is a machine like this.

If you take to this understanding then you are well positioned to view the entire human body as incidental to being human. It's like the old line of reasoning with an amputee.

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<http://www.nytimes.com/2008/09/05/science/05brain.html?ex=1378353600&en=9accca8451681b5d&ei=5124&partner=permalink&exprod=permalink>

An amputee is still human, so clearly your limbs aren't necessary. But it goes further than that. An amputee, in the past, couldn't walk or interact with the world like a normal human, so perhaps you could argue a lack of limbs diminishes something.

Yet now we are understanding that you don't even need your eyes to see. Nowadays, you don't even need your legs to run. Observe Oscar Pistorius³, born with no lower legs, and yet he was initially barred from even trying out for the Olympic sprinting event because his prosthetic legs are in some ways substantially superior to the legs with which most humans are born. In fact, it seems your entire body, except your brain, could be replaced with alternate input devices without either degrading or losing any sensory or interactive capability -- in many cases, you would enjoy a benefit from such a replacement.

The Source of Humanity

Where then is your humanity stored? What does it even mean to be human, if your body is irrelevant, and maybe even holding you back? We've established that your body is just a collection of input devices wired to your brain, but you are not just a collection of sensory experiences. The answer, I think, has to do with information. Specifically, patterns of information. But more on that later.

Understanding that our bodies are incidental to our sensory experiences has profound implications. As we come to really *get* the reality that our current bodies are non-human logical response machines hooked up to our brains, we will begin to open the doors to entirely new ways of experiencing and manifesting our humanity.

As yet another concrete example, a woman named Claudia Mitchell⁴ is missing an arm. She now has a robotic prosthetic limb wired to a computer which is itself wired to her nervous system. She can move her prosthetic arm in the same way you move your arm -- by thinking "move my arm."

Of course, that isn't a very realistic way of putting it. It isn't quite accurate to say either you or Claudia moves by "thinking" the thought "move my arm." It is more accurate to say you move your arm (and Claudia moves her robotic arm) by firing the neural array which causes your body's arm to move. The thinking involved is sublingual, and better described as the execution of a logical equation: *If* a certain neural array in your brain fires, *then* your arm will move in a particular fashion. Because Claudia's prosthetic is wired to a computer capable of understanding these logical equations, and because this computer is wired to her nervous system, she is able to move her arm with the same kind of "thinking" as you or I.

In this fashion, her robotic arm is indistinguishable from her old, fleshy arm. Indeed, viewed this way, it may be more accurate to describe your own fleshy arm as a prosthetic as well.

³ http://sportsillustrated.cnn.com/2008/writers/david_epstein/05/16/Pistorius/index.html

⁴ <http://www.washingtonpost.com/wp-dyn/content/article/2006/09/13/AR2006091302271.html>

There is already a prototype upgrade which allows the computer wired to the robotic arm to receive external stimulus input. In other words, if a burning candle is held beneath the robotic arm, it will heat that section, and the temperature increase will be relayed to the computer. The computer will generate an electrical pulse which will travel up Claudia's nerves and into her brain, where it will activate a neural array which will cause Claudia to experience the sensation of heat *on her robotic arm*. Indeed, it will be entirely accurate to say her robotic arm feels hot, in the same way your arm would.

After all, this process is identical to the way in which you "feel" heat on your arm. In truth, neither the robotic arm *nor your arm* feels heat. You feel heat, not your arm. Remember, you can see without your eyes, and you can feel heat on your arm without having an arm. The body is incidental, what is ultimate are the neural arrays activated in your brain, and those neural arrays are activated using logical equations of the sort *if X then Y*.

When I began to *grok* the fact that I experience the world through my experiences, I started to see almost everything in terms of these logical relational connections. It appears that all experience is a process of building simple logical equations with complex variables. Just as there are important implications in realizing the incidental nature of the human body, so too is there remarkable consequence in understanding human interaction in terms of logical equations.

Video games can help illustrate this understanding. Video games are a simple, but enjoyable, exercise in mental flexibility. As a player, you must dynamically restructure the mental models you use to manipulate "virtual" outputs.

For example, when I first began playing the video game Soul Calibur, I started out activating a neural pulse to twitch my index finger to press the A button to make my in-game character block the next attack. In time, my perception altered such that the middle part was cut out of the sequence. When I am "in the zone" while playing this game, it's just the neural pulse that causes a horizontal attack. That is to say, I lose awareness of my fingers or the controller.

I build a mental model wherein a certain neural pulse manipulates the virtual game world, similar to how certain neural pulses allow me to manipulate the real world.

What is happening (in both reality and virtual reality) is arbitrary logical processing. I am creating a mental model of simple equations with complex variables. For example: When A, then B, where "A" can be learned to be "experiencing the sound effect of an enemy player drawing back their weapon to strike me" and "B" can be learned to be "firing the neural array which causes my character to block."

That is one of the things I love about new video games: they have a new "language" of outputs and inputs. The fun is in learning successful relational connections between them.

If you don't play games, don't worry! This process is identical to the process you went through when you learned to catch a ball. Your brain created a mental model of simple equations with complex variables. For example: When A, then B, where "A" has been learned to be "experiencing the sensation of seeing an object move towards your face" and "B" has been learned to be "firing the neural array which causes my body's arm to intercept the ball."

You may understand this better if you have lost an arm. Shortly after losing the limb, if someone were to throw a ball to you your brain would reflexively fire the neural array which causes your body's arm to intercept the ball -- even though you have no arm. This would generate a phantom limb experience, which is what happens when your brain fires a neural array that in the past manipulated one of your body's now-missing limbs. The limb is gone, but the logical equation and the neural array remain. Since your body is merely incidental in your experiences, it does not matter that this limb no longer exists.

It is true that you experience the world through your experiences -- and nothing else. This may cause you to wonder if reality, then, is only what your brain perceives. In Peter Godfrey-Smith's book *Theory and Reality: An Introduction to the Philosophy of Science*, he describes a philosophy that suggests that very thing: that there is no reality, or if there is we cannot really know anything about it, because all we can know are our subjective experiences.

But remember the rose and the song. There is an objective reality. Things in the world have an objective existence which stimulates your sensory machines, which in turn stimulates your brain. Perhaps the objective thing results in a sensation of redness for you, and a sensation of greyness for your colorblind friend. It is the same objective thing -- a material which reflects light at a certain frequency -- but it has different subjective qualities depending on the machine receiving the stimulus.

Patterns of Reality

It has become clear that our bodies are incidental in the definition of our humanity. What then, can we say is our humanity? I contend that it is intimately bound up in the logical equations described above. Your unique personality could be described as the unique relational connections you have established between all the variables you have encountered. The source of our humanity, then, is in the patterns of information we represent.

Ray Kurzweil, in *The Singularity is Near*, discusses patterns of information in a similar way. His thoughts on the subject, together with Levitin's in *This Is Your Brain on Music*, have been great influences on my thinking.

If I've described our bodies accurately, then you could be fundamentally described as a pattern of information. The key here, I believe, is the word *pattern*. A rock is information.

It is even somewhat orderly. But it isn't very interesting. It lacks...humanity. The same goes for a tree, an amoeba, or even your own body. These are all living things which are organized in an orderly way, but they lack a certain charming quality we might call humanity.

Even your own body lacks this quality of humanity, this spark of creative and self-reflexive curiosity and personality. After all, it is not your legs that find gratification in hiking through Death Valley, it is *you* who enjoys that experience. Indeed, it is *you* who has that experience -- your legs are wholly incidental to the experience -- as mere logical response machines, they experience nothing.

You are a distinct and recognizable pattern of information. That is to say, you are a unique assembly of many logical equations with complex variables, many of which are recursive and which tend to build on each other. It becomes apparent that your body isn't human at all.

I think it goes a little further than that, though. Understood in this way, we can begin to see that just as you are not your arms or your legs or your eyes, so too you may not even be your brain.

Your brain is what generates all the experiences you have, and your brain is informed by its input devices -- your incidental and non-human body. But your brain is just a medium upon which is executed the human collection of logical equations which define who you are.

Patterns of information, my fellow of humanity, patterns of information.

Think about it.

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