

Welcome back. This is one of my favorite lectures of all time. We've already seen evidence that the craziness of the world begins early on. And believe me, it only gets crazier from there. Recall from the last time we were talking about how neurons work. We looked closely at a special type of neuron, the sensory neuron. The sensory neurons transmit information from the environment to other neurons in the brain. An important point was that the form of physical information received from the environment was relayed to other neurons via process of transduction.

Transduction, in the case of sensory neurons, translated the physical stimulus from the environment to a neurochemical form of energy in the brain. Note that things have changed. The representation of the environment is no longer in its physical form. Thus our experience of the world is really our experience of our new representation of the world.

The way that sensory neurons work suggests that we do not directly experience our world. Rather, we experience our own mental representation of the world. This idea was explored a very long time ago by this guy-- Rene Descartes. He was a smart guy. Among the other things he was responsible for creating was a Cartesian coordinate plane. You may have wondered why it was called the Cartesian coordinate plane. And now you know. This is the basis of calculus.

In any case, Descartes was very smart, but he drove himself crazy while he was in Amsterdam. One question haunted him. He wondered whether he existed and spent a great deal of time looking for evidence of his own existence. You might say, well, why didn't he just look in the mirror. Well, you see, Descartes did not trust his senses. While contemplating his existence, he holed up in a small Cabin In Amsterdam that was lit by a candle. He noticed that the candle changed form, but also changed color as the day and the lighting from the outside changed.

Was that candle really changing its form? Yes. Was the candle really changing color? No, but it looked that way. If the only evidence for the form of the candle changing is that it appeared to be changing, then what sort of evidence is that? Descartes concluded he existed because he had a memory for the different forms and colors. Cogito, ergo sum. I think, therefore I am.

Here is a chance to appreciate what the Descartes was saying and its implications for how the mind works. This is a Necker cube. Check it out. Can you get it to flip? Of course, the lines of the cube didn't move. This is just your mental representation of the cube changing. In fact, no lines need be present at all for you to see them.

Here are two more examples of your sense of vision playing tricks on you. On the left side, the angle causes the

long straight edge to appear to bend slightly. See it? On the right is the Muller-Lyer illusion. The two horizontal lines are exactly the same length even though the green line appears shorter.

The craziness of the mind begins when it performs its most basic tasks. As Descartes said, this consideration is of the greatest help to me, not only for noticing all the errors to which my nature is liable, but also for readily correcting or avoiding them. I know all of my sensations are much more often true than delusive signs and matters regarding the well-being of my body. I can almost always use several senses to examine the same object. Above all, I have my memory, which connects the present to the past, and my understanding, which has now reviewed all the causes of my error.

True or false-- physical forms of energy are converted into electrochemical forms of energy by sensory receptors. The answer is true. True or false-- Descartes questioned his existence. The answer is true. Cogito, ergo sum. Descartes believed he existed because we should trust our experience of the physical world. The answer is false. Descartes noted that our senses of the world can be misleading.

According to Descartes, cogito, ergo sum. True-- I think, therefore I am. Flipping the Necker cube indicates that we may at different times experience the same thing in different ways. The answer is true.