**SPIRAL ILLUSION**

**Station Script**

“Everyone, stand 8-10 feet away from me and don’t block the traffic flow of the crowd. I am going to spin this target for 30 seconds and you should concentrate on the center (point to the black center). Breathe normally and feel free to blink if you have to.”

The switch on the drill is a “rocker switch;” pressing the top of the switch will make the target spin in one direction, pressing the bottom of the switch will make the target spin in the opposite direction. Press the top half of the switch first. Begin counting the seconds to yourself, one-thousand-and-one, one-thousand-and-two…. At about 15 seconds remind the subjects to keep watching the middle. At about 20 seconds, count down to 0 loudly but slowly: ten, nine, eight …. When you get to zero, quickly stop the target, lower it to your side and tell everyone to look at your nose (remember to point to your nose). Everyone should momentarily see your head shrinking!

“Now that I have all of you wound up, I need to ‘wind you down.’ After all, I can’t send you home this way! I’m going to spin the target in the opposite direction, for 30 seconds. Remember to look right at the middle of the target (point to the middle), breathe normally and you can blink if you have to.”

Press the bottom half of the rocker switch on the drill to make the target spin in the opposite direction. Begin counting the seconds to yourself, one-thousand-and-one, one-thousand-and-two…. At about 15 seconds remind the subjects to keep watching the middle. At about 20 seconds, count down to 0 loudly but slowly: 10, 9, 8 …. When you get to zero, quickly stop the drill, lower the target to your side and tell everyone to look at your nose (remember to point to your nose). Everyone should momentarily see your head expanding!

What Is Happening

First, you have to look at a Neuron. Use the “Anatomy of a Neuron” diagram of the 3-D model of a neuron. It is a single cell with Dendrites that receive signals, a cell nucleus, and Axons that transmit the signal forward to Axon Terminals. So, Neurons send electrical impulses forward in one direction only: Dendrite-to-Axon-to-Axon Terminal-to-Dendrite of the next cell. Because they are living cells, neurons have a “Base Firing Rate” but they can also fire much faster or much more strongly.

In the back of each eye is your Retina. Among other things, the Retina has light sensitive Rods and Cones. Attached to the Rods and Cones are Neurons which travel from the Rods and Cones to the Brain. Some of these some Rods are specialized to sense when an object in front is getting bigger and other Rods are specialized to sense that an object is getting smaller. The Rods are connected to neurons.

When the Rods “sense” light, the pigment molecules inside the Rods absorb the light photons. This causes the Rods to “bleach.” The “bleaching” changes the concentration of molecules in the Rods. If the change is sufficient in magnitude, the associated neuron will depolarize and fire. The “firing” of the associated neuron sends signals to the brain. When a neuron “depolarizes,” the relative number of positive and negative ions on each side of the axon wall changes such that an electric current moves down the length of the neuron.

When an object moves, the wavelengths of light that were being blocked by the object are revealed and become known to the Optic Nerve. The brain, upon receiving the new information, realizes the new information does not square with the old information and determines whether and how an object has changed in size or location. That’s important because if something is getting bigger in front of you, it may be coming to eat you! At the same time, if you are chasing something to eat it and it is getting smaller, your brain knows you are not making any progress.

When I turned on the drill to spin the target, the “Getting Bigger Rods” sense something is getting bigger, they cause their attached Neurons to fire rapidly which sends a “Getting Bigger” signal to the Brain through their Axons. At the same time those “Getting Bigger Neurons” send other Axons with a signal to the Dendrite(s) of the “Getting Smaller Neurons” to inhibit (or stop transmitting) their base rate firing.

But, after some time, your “Getting Bigger Neurons” get tired just like your muscles, and stop firing. But your Brain recognizes that those cells are tired and continues to tell its Master the object is getting bigger. When I stopped the drill, put the target to my side and pointed to my nose, your Brain sensed a change in the scene. But your “Getting Smaller Neurons” continue firing at their base rate and are not Inhibited by the “Getting Bigger Neurons” because they are still too tired to fire, and you brain temporarily receives a “Getting Smaller Signal.”

The reverse happened when I “wound you down.” The “Getting Smaller Neurons” begin firing and also inhibit the “Getting Bigger Neurons.” Then, the “Getting Smaller Neurons” get tired, cease to fire but your Brain adapts and keeps telling its Master the object is getting smaller. When the scene is reset by stopping the drill, putting down the target and pointing to my nose, the “Getting Bigger Neurons” are firing at their Base Rates, they are not being inhibited by the tired “Getting Smaller Neurons” and your Brain temporarily senses that the object is Getting Bigger!

Something very similar happens with the Ambiguous Cylinder exhibit. Except Rods and Cones that specialize in sensing straight vertical and horizontal edges are competing with other Rods and Cones that sense curved edges.