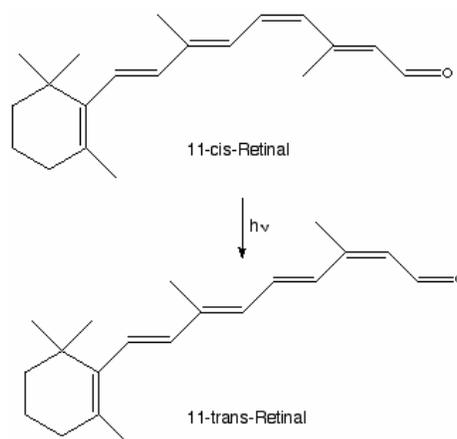


Retinal Fact Sheet

A **molecular switch** resembles an electronic switch we use to turn on and off lights. A **molecular switch** is a much, much smaller (nanoscale) "device" in which one biochemical partner controls the activity of another. **Vision** is one of many processes in your body controlled by a **molecular switch**.

COOL FACTS

- When light hits our eye it only takes a few trillionths of a second to turn the switch on!!!
- The switch in our eyes sends a real electric impulse to our brain, just like when you flip switch and it sends the electricity to a light bulb!!!
- Your eye contains 100 million rods and 7 million cones!!!
- Our eyes only sense three different colors, Red, Blue, and Green. Our brain then combines those three colors for all the different colors we see.



Light turning on the "switch"
"which allows us to see."

FAQ's

Q: Where are the switches in our eyes?

A: The switches are located in two types of cells in our eyes, the rods and the cones. The rods and cones are given their names because the cells really look like rods and pine cones.

Q: What are the "switches" made of?

A: The switches are made of a chemical called Retinal. Retinal has two forms a cis form and a trans form. When the retinal is in the cis form the switch is turned off and when it is in the trans form the switch is turned on.

Q: How do the switches work in our eyes?

A: The switches work in both the rods and the cones. In both the rods and the cones the switch sits inside a well in a protein. When the switch is turned on it sends a signal through the protein that is interpreted by our brains.

Q: What is the difference between the rods and the cones?

A: The rods and cones have different functions in the eyes. The rods are responsible for vision in low levels of light while the cones are responsible for color vision and detail.

Q: How do the switches work differently in the rods than they do in the cones?

A: The switches themselves do not work differently, it is the protein that the switch sits in that is different. The protein in the rods is called scotopsin, while the proteins in the cones are called cone pigments.

Q: What causes our brains to interpret what we see?

A: When light hits the switch it converts it from the cis form to the trans form this causes an electrical impulse to be sent to our brains through nerve fibers that are connected to our eyes. The electrical impulse travels down the fibers to the primary visual cortex where the impulses are converted into what we see. Just like cable TV, electrical impulses are sent over wires to a TV where they are converted to visual images!!!

RELEVANCE TO OUR LIVES: Molecular switches control many functions of our body. They allow us to see, the retinal "switches on" our vision and allows us to see color, without it, we and all other vertebrates are blind. Another molecular switch in our body controls our muscles, myosin tells our muscles to either flex (on) or release (off).

RESOURCES:

Discovery: Molecular Switches: <http://dsc.discovery.com/news/briefs/20020909/dinodna.html>

Our Sense of Sight Color Vision: <http://faculty.washington.edu/chudler/eyecol.html>

How vision works: <http://science.howstuffworks.com/eye.htm>