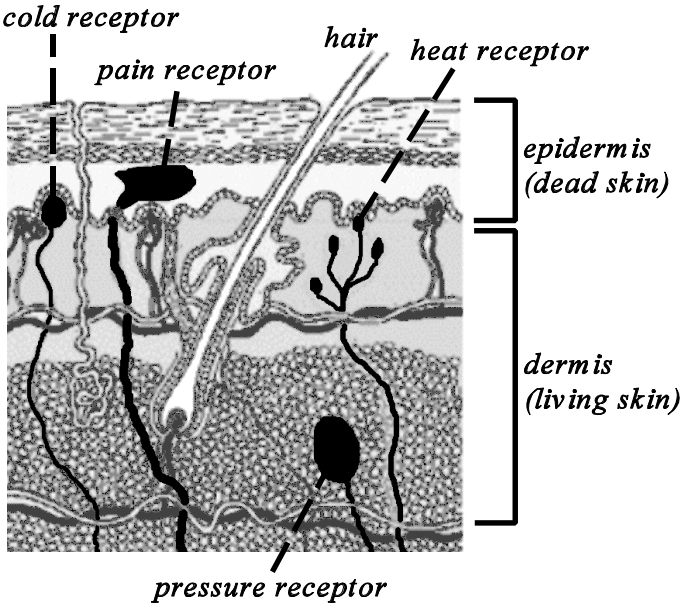
Activity #5:
Can't Touch This!

Background

Your skin does more than just hold your insides in... it helps you feel things, using your ***sense of touch***.

Throughout your skin, you have special structures called ***nerve cells***. These are special cells in your body that feel cold, heat, pain and pressure. They are found all over your body, but there are places where you have more nerve cells, and places where you have fewer. Also, there are differences in how many of a certain *type* of nerve cell there are in different areas of your body.



A cross-section of your skin, showing different receptor cells.
(adapted from tqjunior.thinkquest.org/3750/touch/touch.html)

For example... if you're eating, or chewing gum, or just talking, and you accidentally bite your tongue, it hurts a **lot**. That's because there are many *pain receptors* in your tongue.

However, if you drink hot chocolate that's just a *little* too hot, your mouth won't be able to sense it right away. This is because there are very few *heat* or *cold receptors* in your mouth. That's why it's so easy to burn your mouth on hot food.

Most of the time, your nerve cells will sense something and send a signal to your brain through your ***nervous system***. (That is a long set of nerves that starts at your ***spinal cord***, a "rope" of nerve cells that come down from your brain. It is protected by your ***vertebrae***, or ***spine***.) The message could say that there's something hot or cold touching you, for example. But that's not always the case.

If you accidentally touch something really hot with your finger, the heat receptors in that finger will sense it right away. It takes a little bit of time for the message of, "Hey, this is really hot!" to get to your brain. In the time it would take for that message to get all the way to your brain, have your brain think about it, and finally send a message all the way back to your finger (telling it to move), you could get severely burned. In this case, when a fraction of a second could mean serious injury, the message is sent directly to your spinal cord (a much shorter distance), which immediately pulls your hand away. This is called a ***reflex action***, and it's extremely important in situations like this.

Activity: *Confusing Temperatures*

We're going to play some tricks on your nerve cells — hot, cold and pressure receptors.

Part One — Weber's Illusion

This trick shows what happens when two different receptors send signals to your brain. Sometimes your brain gets confused, and strange things happen.

You will need:

- a partner
- two identical coins (the heavier, the better)
- two cups or glasses — one with ice water, the other with warm water (*not* hot water!)
- a towel

Lay down and close your eyes. Have your partner put one coin in each cup, and leave the coins there for one minute. After a minute, your partner should take the coins out, quickly dry them with the towel, and place them about three finger-widths apart on your forehead.

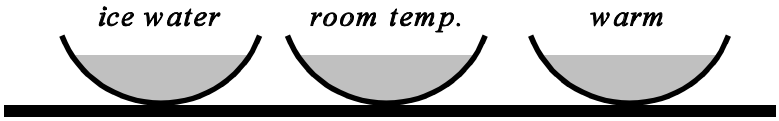
Which coin feels heavier? What receptors are being used? Which receptor is being *tricked*?

Part Two — Wacky Water

Sometimes when certain receptors get used to a certain amount of heat or cold (for example), they get a little "lazy." Then you can start playing tricks on them, and feel some very strange things.

To play these tricks, you will need three bowls big enough for you to fit your hands into.

Half-fill one of the bowls with ice water, another with warm (*not* hot) water, and the last one with room-temperature water. Arrange them like this:



Put one hand in the cold bowl and another in the warm bowl, and leave them there for a minute or so. Then, quickly plunge both hands into the middle bowl.

What temperature does your left hand think the middle bowl is? What about your right hand? Why do you think they feel that way?