CHALLENGE LEVEL

COOL FOOLER

MATERIALS AND EQUIPMENT

- 3 pennies
- a refrigerator

Which is more accurate: your ability to sense temperature or your ability to sense pressure? The next illusion is one answer to this question.

Method of Investigation

1. Put two pennies in the refrigerator for about five minutes.
2. Hold the third penny for the same amount of time so that it becomes the temperature of your hand.
3. Quickly place the two pennies from the refrigerator on a counter in a line with the "neutral" penny in the middle. Place the first three fingers of one hand on each of the three pennies. What temperature is perceived by the middle finger?

Observations & Suggestions

Amazingly, all three pennies feel cold, including the one in the middle. This is because your sense of pressure is more accurate than your temperature sense. Your brain assumes that a temperature stimulation that comes from the same place as a pressure stimulation is caused by the pressure stimulation. Since there is pressure on all three fingers, the middle finger is fooled into feeling cold, just like the two outer fingers, although the penny is the same temperature as the finger.

Do you get the same effect when the two outer pennies have been warmed up by putting them in hot water and the middle penny is neutral?

Your skin has receptor cells that are sensitive to either hot or cold but not to both. The heat receptors respond to warmth with an increase in the number of messages sent to the brain, or *firing rate*. They react when the temperature is between 73°F and 117°F with the most nerves firing at 100°F, just above body temperature. Above 117°F they stop reacting, and heat-sensitive pain receptors begin to fire. Cold receptors fire as the skin gets cooler between the temperatures of about 95°F and 55°F. (Remember, the skin is only a few degrees cooler than the interior body temperature of 98.6°F.) The largest amount of firing occurs around 77°F. They also fire when things get very hot from 113°F to 122°F. At higher temperatures, the receptors are too damaged to fire.

Key Words: touch and illusion · touch receptors

CHALLENGE LEVEL

A VERY HOT ILLUSION

MATERIALS AND EQUIPMENT

- 2 1-foot-long pipe cleaners (known as chenille stems in craft stores)
- 2 small bowls
- hot and cold water

What happens when very warm and cool temperature stimulation are close to each other in a way you don't normally experience?

Method of Investigation

1. Lay the pipe cleaners flat and bend them back and forth so that they look like an S. Nest the pipe cleaners together and put them on the counter.
2. Fill one bowl with cold tap water and the other with very warm but not overly hot tap water. Put a pipe cleaner in each bowl.
3. Working quickly, remove the pipe cleaners and fit them together again on the counter. Put your forearm gently on top of the pipe cleaners. Surprise! The sensation is not what you'd expect!

Observations & Suggestions

Instead of feeling warm, or warm and cool, the combined stimulation produces a feeling of intense heat. Some people find it so hot that they have to remove their arm from the pipe cleaners. The temperatures of the pipe cleaners stimulate both cold and warm receptors in the same area of the arm. In this case, the brain interprets this as a single, very hot sensation.

Key Words: touch illusions • temperature and perception