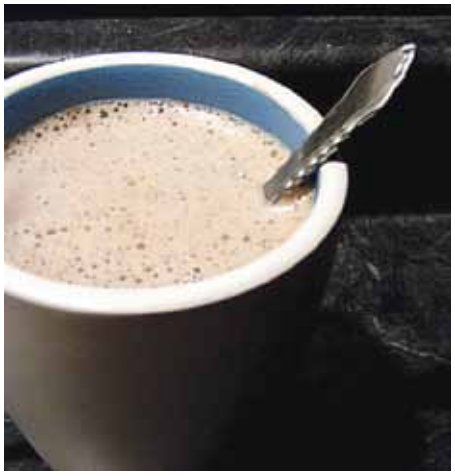
How Heat Travels

Have you ever burned the roof of your mouth on hot pizza? Or burned your feet from walking barefoot across hot asphalt or beach sand on a hot summer day? Have you ever wondered why you get sunburn? These examples all have something in common; heat! Heat moves and it moves from warmer matter to cooler matter. But how does heat move from warmer matter to cooler matter? Heat moves in three different ways: by conduction, convection, and radiation. As you read the descriptions, try to think about every day situations that involve the different types of transfer.

Conduction



Imagine you just came in from a cold winter walk. Your older brother helps you make a cup of soup. You get a spoon and put it in the bowl of hot soup. The phone rings and it's your friend. You talk for a minute and then go back to eat your soup. Wow! The handle of the metal spoon got really hot! How did this happen? The metal spoon became hot because the spoon is in direct contact with the soup. As the heat from the soup comes in contact with the bottom of the spoon it moves up to the cooler end, all along the entire spoon up to the top. The heat moves through the spoon because the spoon is colder than the soup and because the spoon is in direct contact with the hotter soup. This type of heat transfer is known as conduction. In order for heat to move by conduction, two things with different temperatures must be touching. Transfer of heat by conduction usually happens in solids such as this metal spoon.

Convection

Your older sister asks you to boil some water so she can make some macaroni and cheese. She tells you she'll give you some if you help. You are hungry so of course you help! Your sister watches you as you put the pot of water on the stovetop. She shows you how to safely turn on the heat. You know you should cover the pot of water so that you use less energy but you are curious to see the water boil. As you watch the water boil you wonder how the

heat moves through the water and makes all the water boil. Your sister explains that the water at the bottom of the pot that is directly above the heat source gets hot and rises to the top of the water. It then spreads out, cools, sinks, and is heated again in a continuous cycle. This continuous cycle of hot water rising, cooling, and sinking is known as a convection current. Believe it or not, without heat transfers by convection, there would be no wind, ocean currents, or mountains!

Radiation

If you have ever held your hand close to a hot stove, it would feel warm without your hands actually touching the hot stove. The sun and fire can do this too. They can warm you even when you are not physically touching them! The hot stove, the sun, and fire are heat sources. The type of heat transfer you are experiencing is heat transfer by radiation. Radiation brings heat to Earth by traveling through nothingness, empty space! There are no solids (like giant metal spoons) touching the Sun and planet Earth and there are no fluids (substances that flow like air or water) setting up convection currents to transfer heat. Amazing!