STAYING WARM

Raccoon Creek Explorers Activity #27

Supplies:

- several plastic bags
- a bowl
- ice cubes
- cold water
- butter, margarine or shortening
- one or all of the following: feathers, cotton balls, crumpled newspaper
- a stop watch (optional)
- paper and pencil to record your findings (optional)

Vocabulary:

adaptation- the natural process by which a plant or animal becomes fitted to its environment.

blubber- the thick layer of fat directly under the skin of marine mammals

heat- a form of energy. The transfer of kinetic energy from one thing to another.

insulator- a material that is a poor conductor of thermal energy

radiation- energy that moves from one place to another

thermal energy- heat, produced when a rise in temperature causes atoms and molecules to move faster and collide with each other.

Background:

When its cold outside, people stay warm by turning up the heat in their homes or wearing warm clothing, but what about animals? How do animals that spend their whole lives in cold environments survive and stay warm? These animals have adaptations that help them live in places like the arctic circle. For example, polar bears have thick fur made up of two special kinds of hairs. One type is oily and hollow, which repels water and traps heat. The other kind are short, insulating hairs that trap heat near the skin. Polar bears and other arctic animals like seals, whales, walrus, and penguins also have another form of insulation: blubber! Blubber is what we call the thick layer of fat these animals carry under their skin. Fat doesn't transfer heat energy very well, meaning it helps keep the animals body heat from dissipating into the cold air or water and keeps them warm, just like a puffy jacket might keep you warm in winter!

Let's Get Started:

1.) Fill a bowl with ice and a little water. (You can add blue food coloring for a fun, arctic effect!)

2.) Fill each plastic bag with a different kind of insulation: feathers, cotton balls, news paper, and a thick layer of lard or butter. Make sure the bags are tightly sealed

3.) Take turns placing each insulated bag on top of the ice, then put your hand on top of the bag and wait until you can feel the cold of the ice. Try placing your hand on the ice without insulation to feel the difference! If you want to, you can measure the time with a stop watch and record the results.

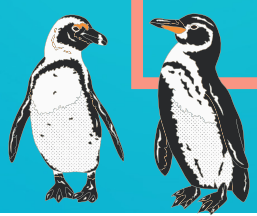
4.) You can also do this experiment by placing you hand inside the insulated bag and then submerging your hand in the ice water! Just be sure to keep the water out of the bags, and save the messy butter/lard bag for last!

Reflect:

Could you feel a difference between the types of insulation? Did your hand get colder faster with some of the bags?

Why do you think some kinds of insulation work better than others? How do you think insulation works?

Why is it important to keep the insulation dry? Is that important for all types of insulation?



Apply:

Like most gasses, air is a poor conductor of thermal energy. Fluffy, hollow polar bear fur and a warm down jacket operate in the same way. The fluff creates a cushion of air between the skin and the cold air, and since it doesn't transfer heat energy well, body heat stays near the body and isn't lost into the cold surroundings. There is no cold energy, and you can never gain cold, but you can loose heat. Thermal energy flows from areas of high heat to those of low heat, so body heat dissipates into the environment and our bodies have to use more energy to produce more heat. At a certain point, the body can run out of energy to produce heat, unless you have adaptations or something else to conserve that body heat! Body fat, what we call blubber in marine mammals, is also a poor conductor of thermal energy and helps creatures like whales and seals hang on to their body heat, even in icy cold water!

Wrap-Up:

Now that you know something about how heat is transferred into the surrounding environment and lost, and about what kinds of things are insulating, you can expand your experiment to other materials.

Try filling bags with different things from around your house and make a guess as to weather they will insulate well or not before you test them. You can also try filling a bag with just air and see how well that works as an insulator.

We've learned a lot about how animals stay warm in cold climates, but what other adaptations might they need to live there? What adaptations would an animal need to live in a very hot climate? Are there situations or places where keeping a lot of body heat might be a bad thing?