Curiosity Guide #607
Convection

Accompanies Curious Crew, Season 6, Episode 7 (#607)

Incensible Patterns

Investigation #5

Description

Can you see invisible air patterns?

Materials

- Air Convection Model. Use with adult supervision. One such product can be found here: Air Convection Device from Sci-Supply
- Candle
- Incense sticks
- Matches
- A friend

Procedure

1) With adult supervision, set up the Air Convection Model so that the candle is centered under one clear chimney.
2) Have a friend predict what will happen if you light the candle.
3) Light the candle. Do you observe any change?
4) Predict what will happen if you light the incense stick.
5) Light the incense and hold it above the second chimney.
6) What do you notice?

My Results

Explanation

When the candle is lit, there is no observable or visible change to the air. The lit candle heats up the air around it, which causes the particles to collide more quickly and more forcefully. Heating up the air also makes the air less dense. As a result, the air begins to rise up through the chimney above the candle. At the same time, cooler air sinks down through the second chimney. The incense emits smoke, which suddenly allows us to see the invisible air convection. The smoke of the incense stick drifts down the chimney with the cooler air current. After several moments, the circular pattern of air movement is very clear. The air movement was occurring when the candle was lit, but because air is invisible, we could not see the air current moving.

This circular motion is called a convection cell. Convection cells occur in fluids like liquids and gases. This investigation shows the rising of the warmer, less dense air and the sinking of the cooler, denser air. This is the same kind of motion of energy transfer that is observed in the atmosphere, the ocean, and even in the mantle of the earth.

This convection movement is also what happens with a chimney. A chimney provides a path for gas and smoke particles to draft up instead of into the room.

Think about this. Gases and liquids can move by themselves naturally or get pushed by machines, like a ceiling fan circulating the air in a room. So there is both natural and forced convection. Think about liquids! Convection currents can happen in something small like a cup of tea or in something huge like the ocean. In both cases, the warmer liquid above transfers energy to cooler liquid below and the liquid creates a circulating current. That's cool! No, warm! No, cool, again!

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