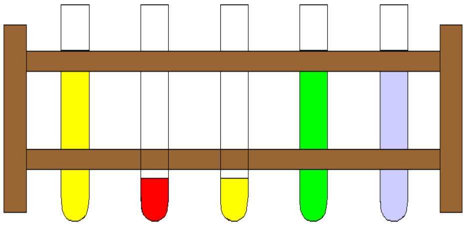
WEBELOS

SCIENTIST

SUGGESTED ACTIVITES

- Visit an industrial lab
- Visit the Museum of Natural Science
- Visit a planetarium
- Visit a TV news weather station
- Visit a high school or college science lab
- Go to a community science fair
- Have a magic show with each boy doing an optical illusion



TEST TUBE RACK SLIDE

Materials needed:
2 tongue depressors
3/16" acrylic rod (4 pieces 1½" long)
transparent model paint (4 colors)
½" PVC pipe

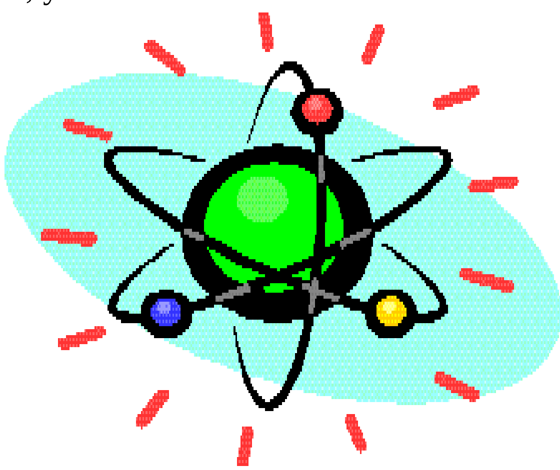
Cut two pieces of the tongue depressor 2" long and two pieces 1" long. Drill ¼" holes down the center at every ½" of one 2" piece (4 holes). After the holes have been cut, epoxy the pieces into a rectangle and let dry completely (use epoxy sparingly). Round one end of the acrylic rods with sandpaper, then dip the rods into the transparent paint, making each one a different color and depth. Epoxy ½" PVC pipe to the tie slide to thread neckerchief through. Let dry completely. Be careful not to bump the rods until they have set up completely.

DIVING RAISINS

Materials needed:
raisins *club soda* *clear drinking glass*

Cut a raisin into four equal pieces and drop all the pieces into a glass of clear soda. They should sink to the bottom. After a few minutes of observation, you will note that the raisins will rise to the surface, dive to the bottom, then rise and dive repeatedly.

Why? Look closely at the raisins. What do you see? Tiny gas bubbles have become attached to each piece of raisin. The raisins and their accompanying gas bubbles rise after their combined weight becomes less than the weight of the water they displace. Eventually, when enough gas bubbles break loose and escape, the raisins sink to the bottom of the glass and the process repeats.



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WEBELOS

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SCIENTIST

CONDIMENT DIVER, WORLD'S SIMPLEST CARTESIAN DIVER

Materials needed:
unopened condiment packet (soy sauce, ketchup, etc.) from fast food or take out order
clear plastic bottle with tight fitting lid (water bottle, soda bottle, etc.)
glass or cup of water

First, you have to figure out if your condiment packet is a good Cartesian diver candidate. Fill a glass with water and drop in your packet. The best packets are ones that just barely float. After you have found the proper packet, fill an empty, clear plastic bottle to the top with water. Shove your unopened condiment packet into the bottle and replace the cap. You're done! Squeeze the bottle to make the diver sink and release to make it rise.

Why? Many sauces are more dense than water, but it is the air bubbles at the top of the sauce that determines whether the packet will sink or swim. Squeezing the bottle causes those air bubbles to shrink. These smaller bubbles are less buoyant and the packet sinks.

BALANCING STICK; WHICH END IS UP?

Materials needed:
one ½" wooden dowel, approximately 3 feet long
fist size lump of clay

Place a lump of clay (about the size of your fist) 8" from the end of the dowel. Wrap it around the dowel. Balance the dowel on the tip of your finger, putting your finger under the end that's near the clay. Now, turn the dowel over and balance it with the clay on the top. Notice that the stick is easier to balance when the clay is near the top.

Why? The dowel rotates more slowly when the mass is at the top, allowing you more time to adjust and maintain balance. When the mass is at the bottom, the stick has less rotational inertia and tips more quickly. The farther away the mass is located from the axis of rotation (such as in your hand), the greater the rotational inertia and the slower the stick turns. An object with a large mass is said to have a great deal of inertia. Just as it is hard to change the motion of an object that has a large inertia, it is hard to change the rotational motion of an object with a large rotational inertia. Here is a way to feel the change in inertia. Grab the end of the dowel that's near the clay. Hold the dowel vertically and rapidly move the dowel back and forth with the same motion you would use to cast a fishing line. Next, turn the dowel upside down and hold it at the end that is the farthest from the clay. Repeat the casting motion. Notice that it is much harder to move the dowel rapidly when the clay is near the top. The mass of the stick has not changed, but the distribution of the mass of the stick with respect to your hand has changed. The rotational inertia depends on the distribution of the mass of the stick.

WEBELOS

SCIENTIST

FOG CHAMBER

Materials needed:

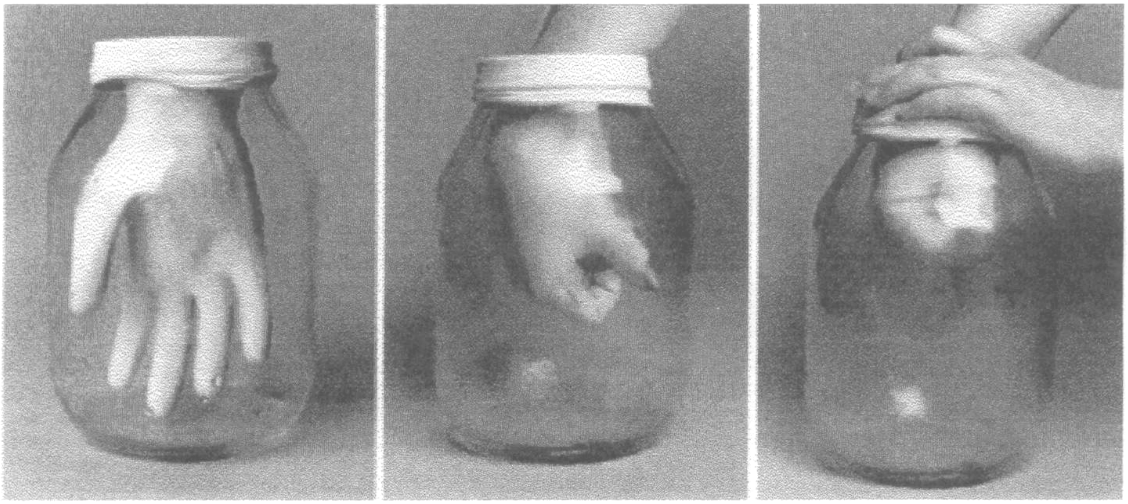
1 gallon clear glass or plastic jar with a wide mouth
rubber glove (Playtex brand works well)
ADULT HELP
matches
tap water

Barely cover the bottom of the jar with water. Hang the glove inside the jar with the fingers pointing down and stretch the glove's open end over the mouth of the jar to seal it (see illustration). Insert your hand into the glove and pull it quickly outward without disturbing the jar's seal. Nothing will happen. Now remove the glove, drop a lit match into the jar, and replace the glove. Pull outward on the glove once more. Fog forms inside the jar when you pull the glove outward and disappears when the glove snaps back. The fog will form for 5 to 10 minutes before the smoke particles settle and will have to be replenished.

Why? Water molecules are present in the air inside the jar but they are in the form of invisible gas molecules, or vapor, flying around individually and not sticking to one another. When you pull the glove outward, you allow the air in the jar to expand. In expanding, the air must do work, which means that it loses some of its thermal energy, which in turn means that its molecules (including those of the water vapor) slow down slightly. This is a roundabout way of saying that the air becomes cooler! When the water molecules slow down, they can stick to each other more easily so they begin to bunch up in tiny droplets. The particles of smoke in the jar help this process along. The water molecules bunch together more easily when there is a solid particle to act as a nucleus. When you push the glove back in, you warm the air in the jar slightly, which causes the tiny droplets to evaporate and again become invisible.

An Added Treat

Shine a slide projector through the cloud you make in the jar. When the smoke is fresh, the droplets will be large compared to all wavelengths of visible light and the light they scatter will be white. As the smoke dissipates, the water drops will become smaller and the light scattered will created beautiful pastel colors at some viewing angles.

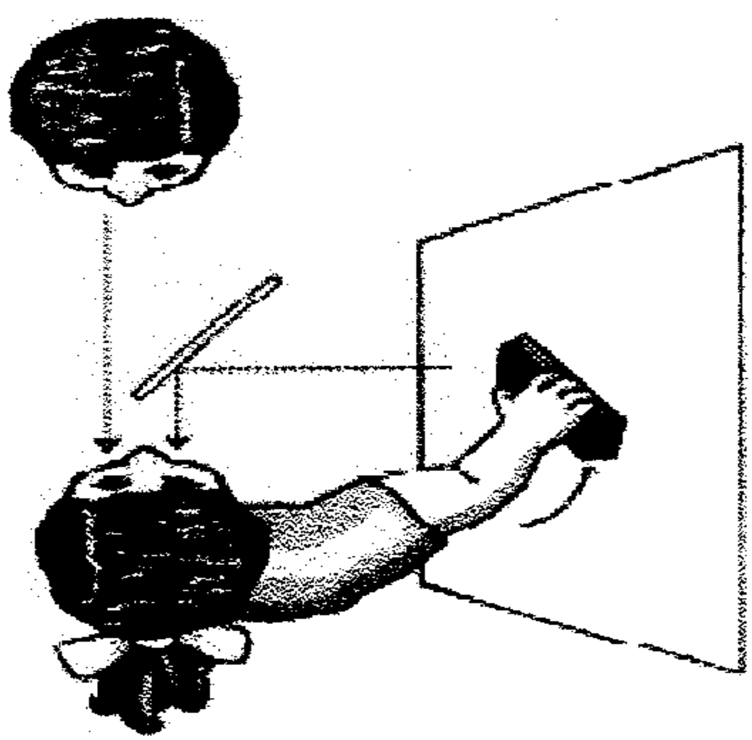


CHESHIRE CAT

Materials needed:
hand held mirror, approximately 4 to 6 inches on a side
white wall or other white surface (white poster board works well)
partner

Sit so that the white surface or wall is on your right. Hold the bottom of the mirror with your left hand and put the mirror edge against your nose so that the reflecting surface of the mirror faces sideways, toward the white surface. While keeping the mirror edge against your nose, rotate the mirror so that your right eye sees just the reflection of the white wall, while your left eye looks forward at the face of a friend who is sitting a couple of feet away (see top view diagram). Move your hand in front of the white surface as if passing a blackboard eraser over the surface. Watch as parts of your friend's face disappear. It will help if your friend is sitting very still against a plain, light colored background. You should also try to keep your own head as still as possible. If you have trouble seeing your friend's face disappear, one of your eyes might be stronger than the other. Try the experiment again, but this time switch the eye you use to look at the person and the eye you use to look at the wall. Individuals vary greatly in their ability to perceive this effect; a few people may never succeed in observing it. You may have to try several times, so don't give up too soon. Give yourself time to see the effect.

Why? Normally, your two eyes see very slightly different pictures of the world around you. Your brain analyzes these two pictures and then combines them to create a single, three-dimensional image. In this illusion, one eye looks straight ahead at another person, while the other eye looks at the white wall or screen and your moving hand. Your brain tries to put together a picture that makes sense by selecting bits and pieces from both views. Your brain is very sensitive to changes and motion. Since the other person is sitting very still, your brain emphasizes the information coming from the moving hand, and parts of the person's face disappear. No one knows how or why parts of the face sometimes remain, but the eyes and the mouth seem to be the last features to disappear.



SQUIRMING PALM

Materials needed:
photocopy of the pattern disk provided
cardboard
adhesive (glue stick, glue, rubber cement, etc.) or tape
access to a copy machine
electric or manual rotator (turntable, variable speed electric drill, portable mixer, electric screwdriver, or hand drill)
if rotator unavailable, pencil with an eraser on top and a pushpin or thumbtack
ADULT HELP
Optional: adhesive-backed Velcro

Cut out the copy of the pattern disk provided and mount it on cardboard with adhesive or tape. Attach the disk to some form of rotator. The adhesive backed Velcro provides a convenient way to mount the disk to a drill or similar device if you choose this option. For a low-tech method of rotating the disk, insert the pushpin through the center of the pattern into the eraser of a pencil. Spin the disk by hand as you hold the pencil. Rotate the disk slowly (1 or 2 seconds per revolution) and stare at its center for about 15 seconds. Now, look at the palm of your hand. Notice that your palm seems to be turning. Your palm will turn in the opposite direction from the way the disk was turning.

Why? Mechanisms in your eye and brain detect motion in various directions. For example, regions of your brain fire nerve impulses when your eye forms images that are rotating in a clockwise direction. Other regions respond to counterclockwise rotation. When something is stationary, both of these motion detectors still fire, but their firing rates are equal. The two signals balance each other out, and you see no motion. As you stare at the spinning disk, the set of motion detectors that respond to its rotation adapts to the motion of the pattern. These motion detectors start out firing rapidly, and then slowly decrease their firing rate. When you look away from the rotating pattern and stare at a stationary object (such as your palm), the motion detectors that have been firing less rapidly are more evident than the ones that have not been stimulated. As a result, you see motion in the opposite direction.

You also have sets of motion detectors that respond to upward and downward motion. If you stare at a waterfall for some time and then stare at the rocks nearby, the rocks will appear to be moving upward. This illusion is known as the waterfall effect.

SQUIRMING PALM, continued

SQUIRMING PALM DISK PATTERN