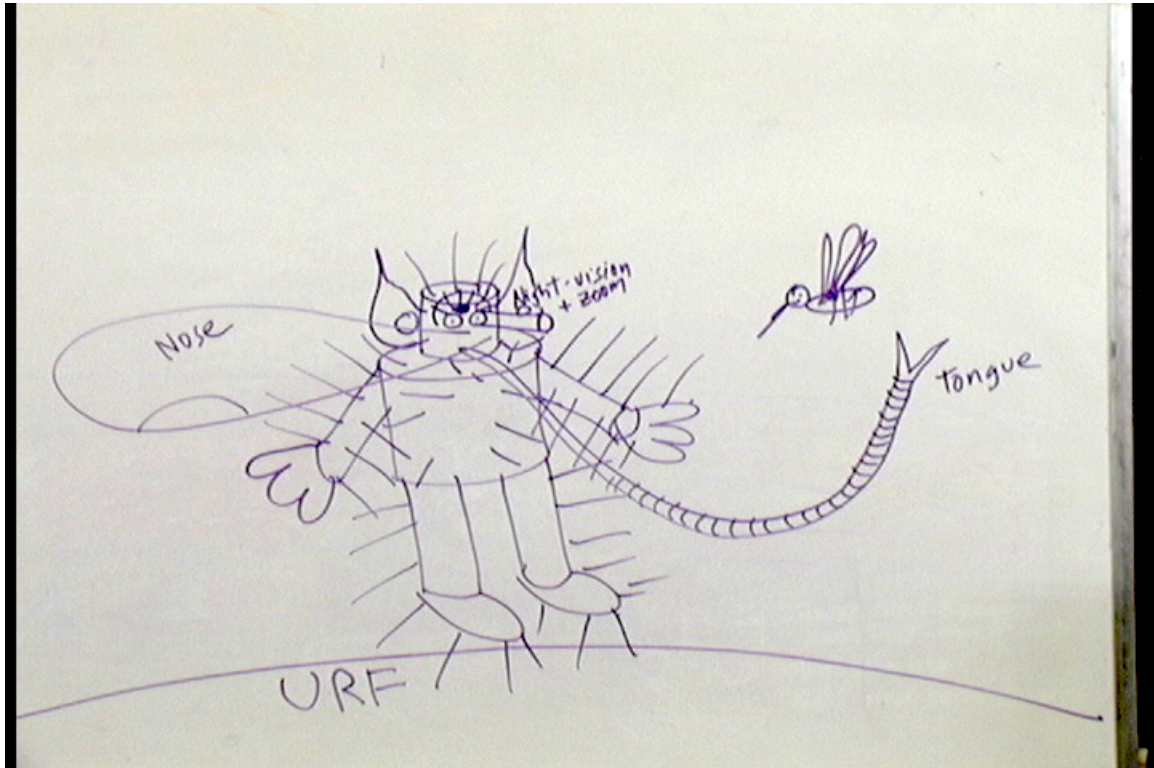


"Objects the Same 2011" Lesson Summary**Intro:**

You decide to go into space, so you make a spacesuit out of a tin can.

You have to watch out for space mosquitos.

You outfit your spacesuit with a night vision zoom lens so you can see the mosquito coming. You also add big ears that can "hear" electromagnetic signals. And you add big whiskers, like cat whiskers, all over your spacesuit so you can feel the mosquito coming. Also, a large tongue, like a snake's tongue, so you can taste the mosquito. The tongue can also roll up like a moth's tongue. Then you add a large nose so you can smell the mosquito.

All these sensors are connected to you brain with wires. Sometimes your senses can be tricked. We're going to do some things that mess up your senses.



Story:

Jack and Jill decided to buy a house. They were on sale for \$10.00. It had a hole in the roof and in the window, the door was coming off its hinges, there were rats in the attic, there was garbage under the house, and there were weeds in the yard all around. The entire neighborhood was houses just like theirs.

EMF lived across the tracks in a nice castle with a green lawn covered in spikes. He had a machine gun nest, which was a machine gun attached to a minion's head, and a remote control so they couldn't shoot each other.

He'd send them out in the neighborhood to shoot up stuff. When they shot holes in the houses, people would hide under their house, and almost everybody had moved out.

When J&J moved in, they bought 500 gal of red paint, patched up the house, and painted everything red. Then the neighbors started painting their houses bright colors, too. They put a string with tin cans on their side of the railroad track so they'd know when the minions were coming, and they could hide under the house. Afterwards, they'd plug up the bullet holes with newspaper and paint them over. And they stopped moving away, which EMF didn't like. EMF sent minions to capture J&J, but they wouldn't come, even when the minions threatened to shoot them. EMF didn't want the minions to shoot J&J in broad daylight because

everyone would know he had done it, so he called the minions back.

He laid a trap. He set up a box like a phone booth and invited people to enter it listen to a mystery. Whoever solved it would win a million dollars. J&J got invitations, too.

When J&J went in, there was a bunch of objects attached to the walls and ceiling, and a sign said if they could figure how all those objects were the same, they'd win.



Experiment, Part 1:

Tell students you're going to show them a bunch of objects, and after they see them all, they have to figure out how they're all the same.

Show a large piece of foam, a toy truck, a can of tuna, a plastic bottle containing marbles in jello, a piece of wood, a rock, a Teflon rod, a piece of aluminum, and a piece of tungsten.

Tell students that you've changed them all in some way to make them all the same. Ask students to guess what you did and why, without touching the objects.

Pass the items around so students can handle them, and see if they can figure it out. Write their guesses on whiteboard. Then have them vote on the most likely answer.

For each answer they voted on, show whether or not it fits by examining the objects.

Bring out a scale and weigh each of the objects to show that they all weigh the same. Explain how each item was modified to make it weigh the same as the others.

Ask for a volunteer. Instructor presses on the student's head with his thumb, and the student says "Ow." Then he presses with his palm and it doesn't hurt. Explain that when you put the same pressure on a small area it hurts, but the same pressure on a larger area doesn't hurt. This is like the tungsten and the foam. The tungsten presses on the nerves and sends a stronger signal to the brain. So the brain misinterprets the weight of the two items.



Experiment, Part 2:

Second groups of objects: A little squirrel bicycle helmet, a bow, a wobbly tube, a flying saucer toy on a string, a PVC pipe, an uninflated balloon, part of a bicycle frame, a pendulum, and a piece of string.

Tell students these items weren't modified like the others. Ask them how they're all the same, and write their answers on the whiteboard.

Then pass the items around so the students can examine them. See if they want to add any more answers. Then vote again.

Demonstrate how each item can make a sound.



Experiment, Part 3:

Your fingers are thermometers.

Some of the stuff in this room conducts heat really fast, like metal. Some conduct it slowly, like a stuffed animal. Wander around and touch things, and see if the fast conductors feel the same as the slow conductors.

Use an infrared thermometer to check the temperature of each student's hand.

If you touch something that has a lower temperature than your hand, it should feel cool, and vice versa.

Use the thermometer to check a metal table leg and the stuffed animal. The temperature of the metal is actually higher than the stuffed animal, but it feels cooler to the touch because it conducts the heat away from your hand.

**Story End:**

Evil Mister Fred didn't care who won the contest. He just wanted to capture J&J, tie them to the railroad tracks, and have a train run over them. But if they won, he'd have to give them the prize.

When J&J went into the phone booth, they said they knew the answer. EMF didn't believe them and said that even if they knew, they couldn't prove it. J&J said they could.

They got a big bucket of water. They said everything in the box floats. EMF said they were wrong.

So J&J took everything out of the box, dropped each one in the bucket, and they all floated, including a rock (pumice).

EMF is furious. Then he accidentally dropped his remote control on the ground and a minion stepped on it. All the minions were facing EMF, and all the machine guns went off at once.