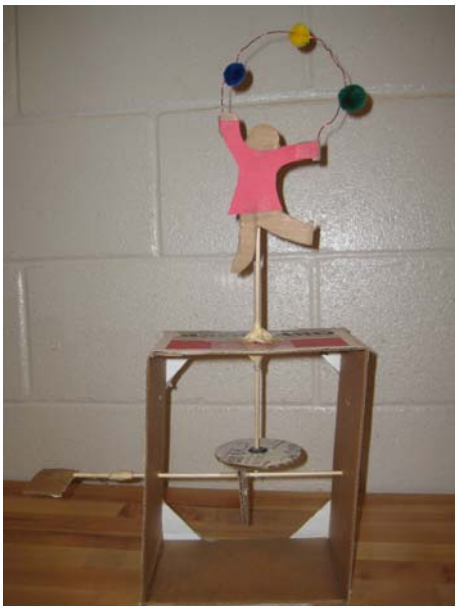
Automata

What Do I Need?

- a cardboard box
- 2 skewers
- a straw
- scissors
- pencil
- scrap pieces of cardboard
- hot glue gun (requires parent supervision)
- decorative materials (felt, glitter, markers, etc.)



What Do I Do?

1. First we need to make our frame by cutting out an opening on one of the faces of the box.

2. Then we need to create the cam and cam follower. Cut out 2 cardboard circles. You will need to poke a hole into these circles, one should be put exactly in the center (cam follower) while the other can be off-center (cam). The movement of the cam follower depends upon where you place the hole in the cam. A centered hole will cause the follower to rotate around, while an off-center hole will both rotate and move up and down.

3. Next we are going to use a pencil to poke a hole into the left and right side of the box and one at the top. Poke the skewer through one side of the box, then through the cam and finally through the opposite side of the box. Then glue the cam to the skewer.

4. The other skewer will go through the top of the box and then through the cam follower. The cam follower will rest on top of the cam. You may need to reinforce the hole on the top of the box with a piece of straw so the skewer slides easier.

5. Now you can try rotating the skewer that sticks out from the side of the box and watch as the other skewer moves. Remember, the motion is determined by the placement of the holes in the cam.

6. Now you can decorate your automata. For example, turn the skewer into a worm surrounded by an apple so the worm pops out of the apple when you turn the lever.

Now Try This!

There are many variables you can change to create different motions. Try increasing the number of cams or changing the placement of the axles in the cam. Can you make your object move side to side or back and forth?

What's Going On?

These mechanical contraptions make use of simple machines. The cam is actually a wheel on an axle. Because the axle is not centered, the wheel actually pushes up on the cam follower creating the reciprocal movement.

Source: Exploratorium's PIE Institute