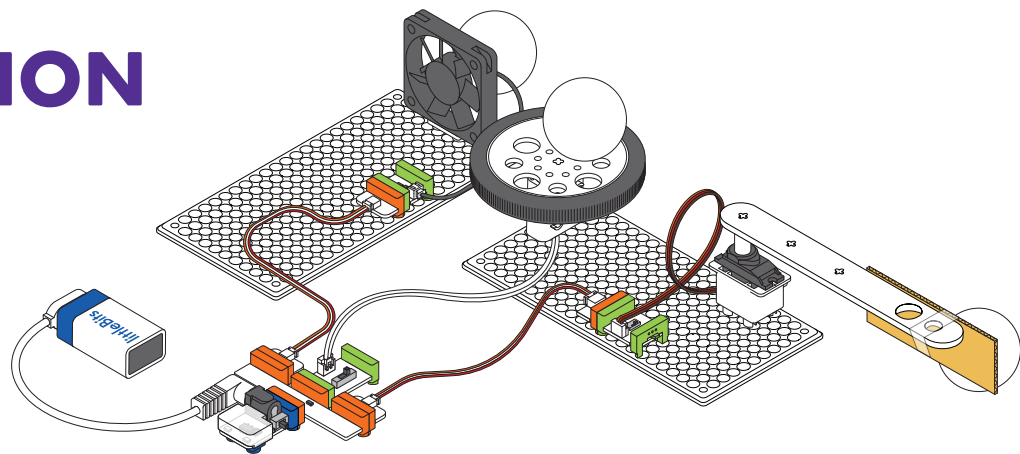


# CHAIN REACTION MACHINE



## GUIDED

### DESIGN CHALLENGE

Design a littleBits circuit that exhibits three different instances of forces and motion (effects) triggered from a single source (cause).



### EXPLORE

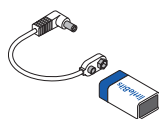
- Complete Writing Box #1 in your guided handout.



### CREATE

Let's create a contraption to demonstrate forces and motion

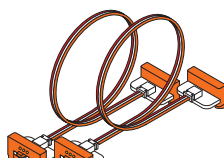
1. Gather your invention tools.



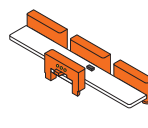
a1 battery & cable



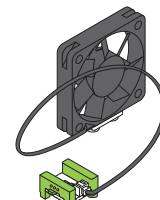
p4 power



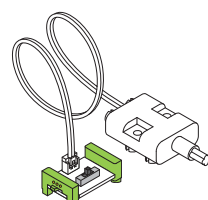
w1 wire (x2)



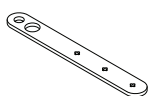
w17 fork



o13 fan



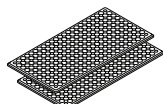
o25 DC motor



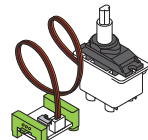
a23 mechanical arm



a25 wheel



a30 mounting board (x2)



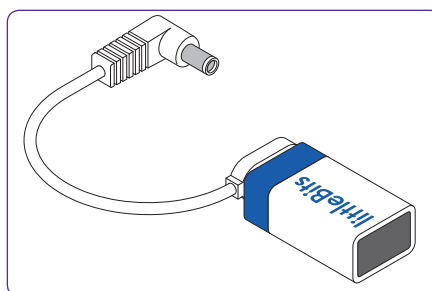
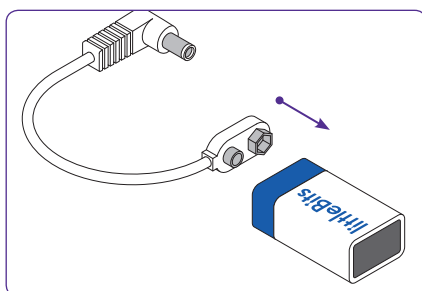
o11 servo

#### Other materials:

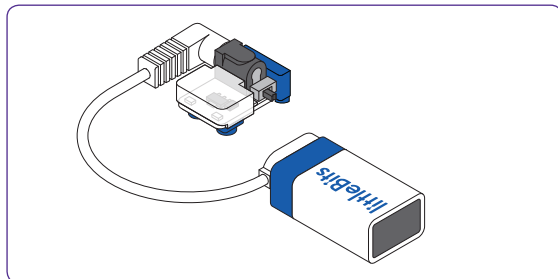
- 3, 1" styrofoam balls
- Marble
- Balloon
- Cardboard (3" x 1")
- Assorted craft materials

(for example:  
glue, tape,  
cardboard, string,  
colored paper,  
scissors)

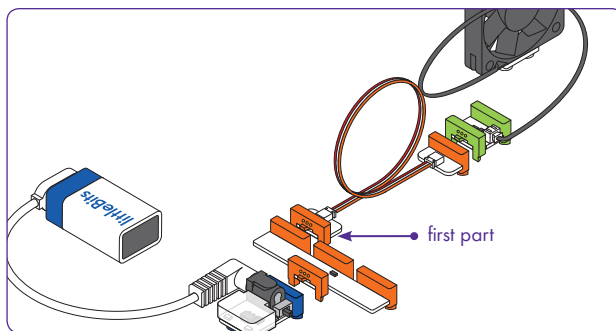
2. Attach the battery cable to the battery.



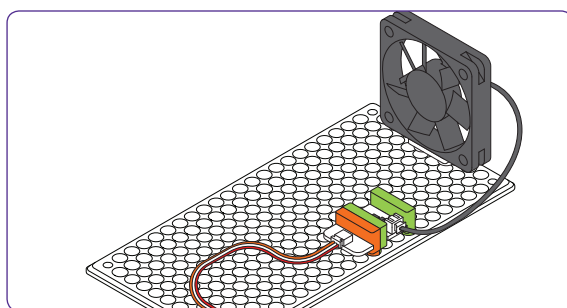
3. Attach the p4 power Bit to the battery cable assembly.



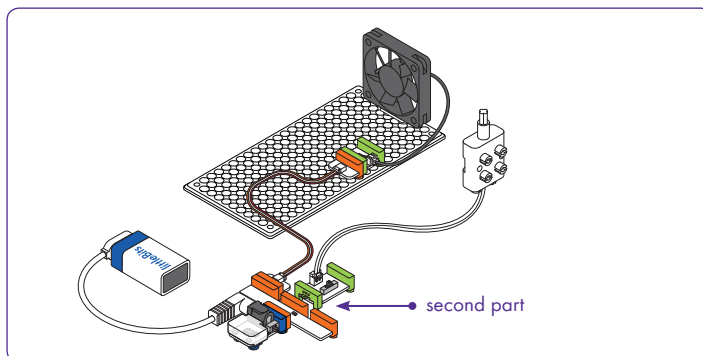
4. Snap the first part of the circuit together.



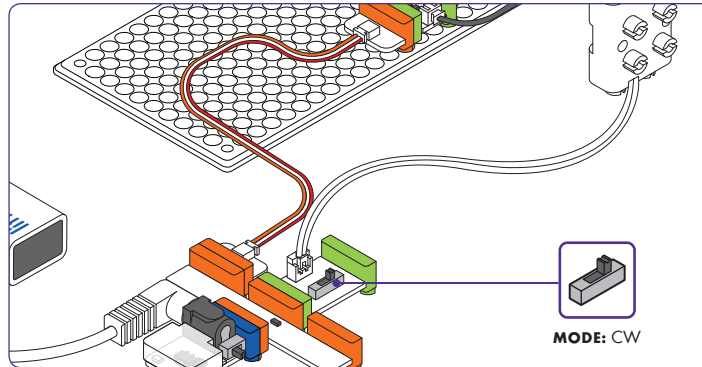
5. Press the end of your wire, fan Bit and the feet of the fan into one of the mounting boards.



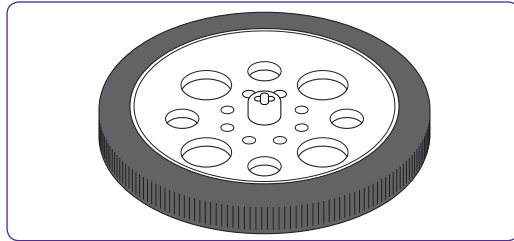
6. Snap the second part of the circuit together.



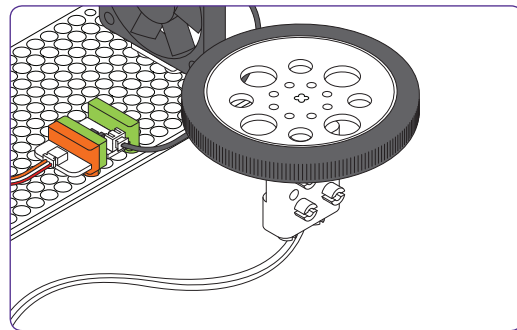
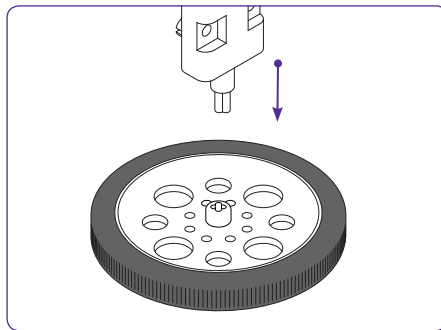
- 7.** Switch the DC motor to CW (clockwise) mode



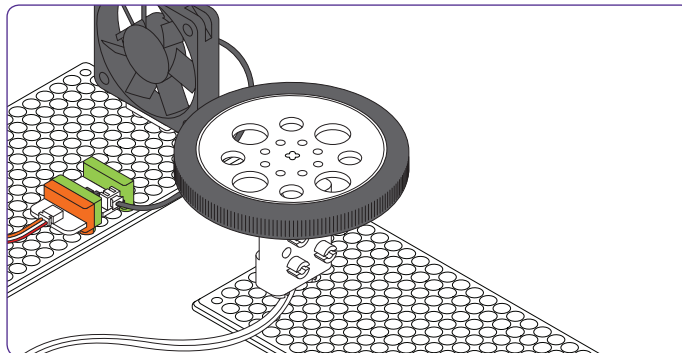
- 8.** Pick up a wheel and lay it on the table with the longer axle side facing up.



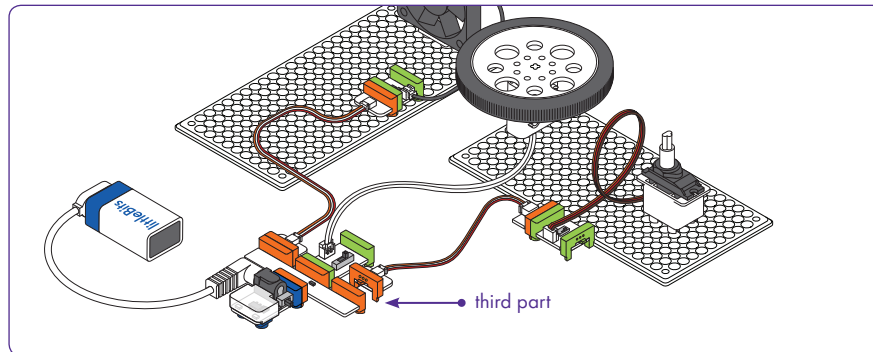
- 9.** Line up the DC motor cross axle with the cross hole of the wheel and gently press.



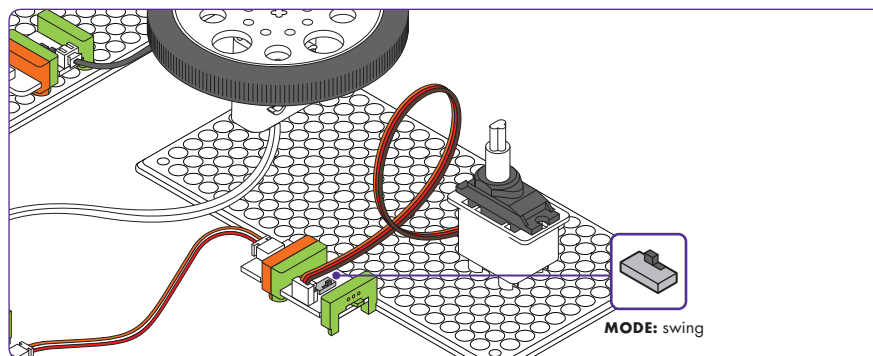
- 10.** Press the feet of the DC motor into the second mounting board as shown.



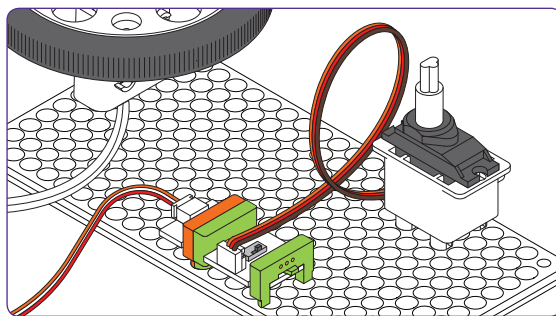
- 11.** Snap the third part of the circuit together.



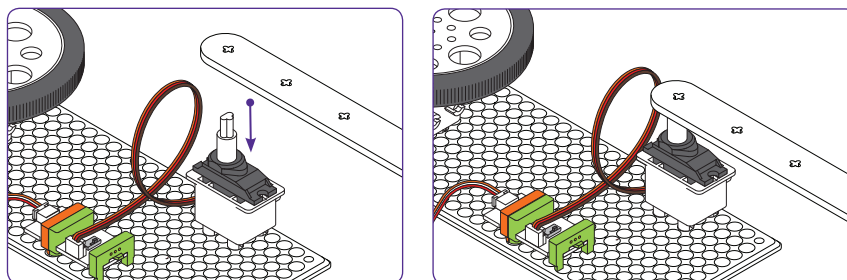
- 12.** Switch the servo to "swing" mode.



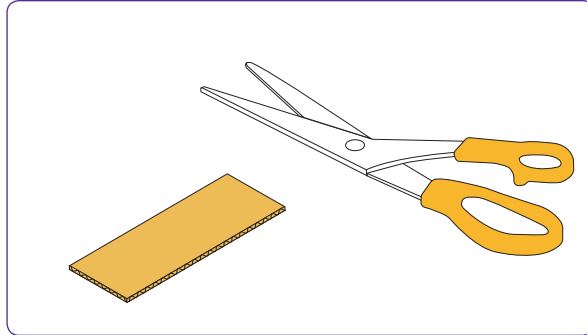
- 13.** Press the wire, servo Bit and servo bucket into the second mounting board as shown.



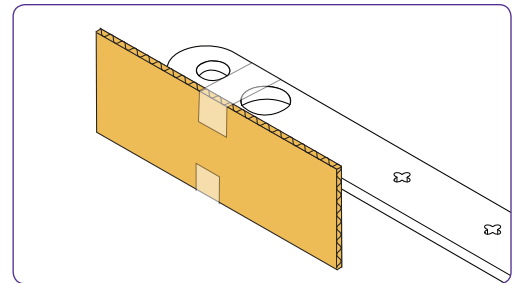
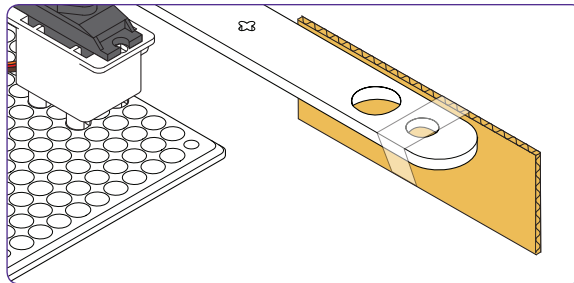
- 14.** Attach the last cross hole of the mechanical arm to the servo motor.



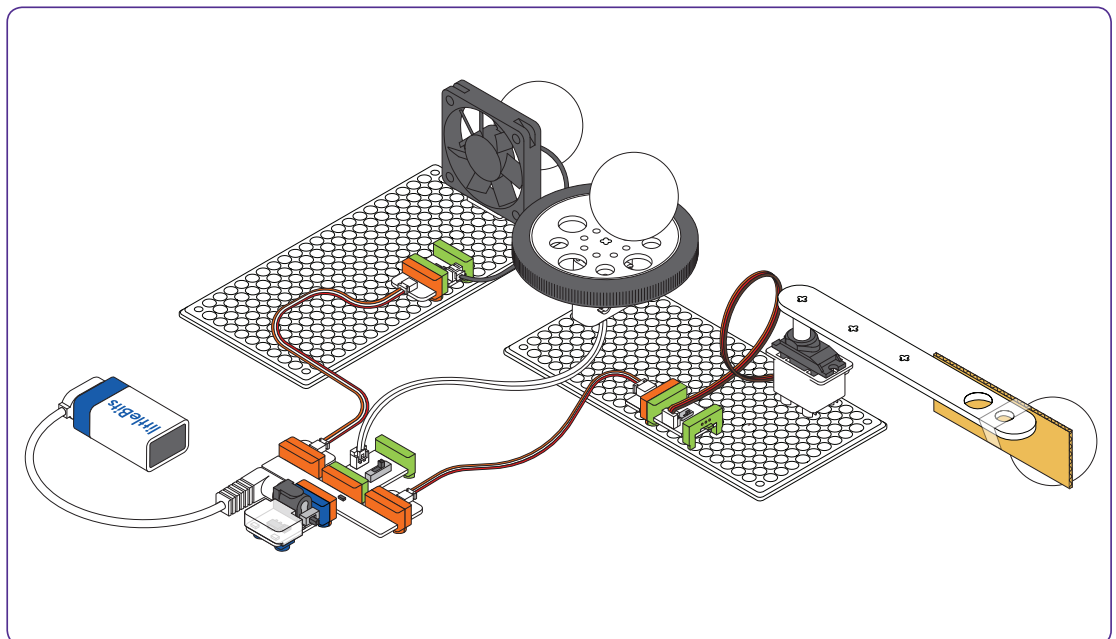
- 15.** Cut out a 3 inch x 1 inch piece of cardboard



- 16.** Attach the piece of cardboard with tape to the mechanical arm as shown.



- 17.** Place one ball in front of the fan, one on top of the wheel, and one in front of the mechanical arm "bat." Each ball will remain motionless until the power is switched on.



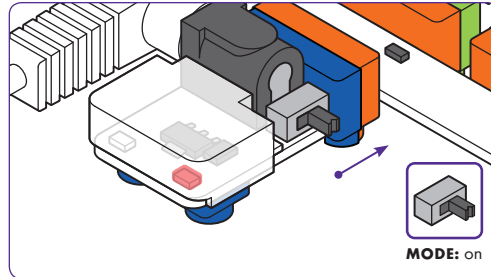


PLAY

## PLAY

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- 18.** Test your creation! Turn on the power Bit and analyze the three different motion “effects.” Talk to your group about what you noticed.



- 19.** Power off your circuit, reset the balls and test your model again but this time assign different members of your group to watch the three different circuits: one person will power on the circuit, one will watch the fan, another the bat, another the wheel. Talk to your group about the differences you saw in the speed of the balls.



WRITE

- 20.** Complete Writing Box #2 in your guided handout.



CLEAN

## CLEAN UP

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- **Until next time, littleBits!** Place the Bits gently back in the box according to the diagram on the back of the Bit Index; return classroom materials to their proper place and check the area around your workstation.

# CHAIN REACTION MACHINE

Name:

## CHALLENGE OVERVIEW

Let's use our Bits to set off a chain reaction of motion!

## GUIDING QUESTIONS TO REACH LEARNING OBJECTIVES

How do forces affect a change in motion?



CREATE

1. Use the space below to record and define vocabulary words that we remember:

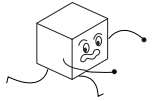


PLAY

2. Referring to your creation, record answers to the prompts:

1. Draw a flowchart of your group's contraption. Using arrows and other symbols, illustrate the cause and effect relationships of your machine.





3. Describe instances of acceleration in terms of:

a. Your first effect with the fan:

b. Your second effect with the DC motor and wheel:

c. Your third effect with the servo and mechanical arm:

4. Draw one instance in your contraption that demonstrates inertia.