Racing Bristlebots: On Your Mark. Get Set. Go!

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p010/robotics/racing-bristlebots (https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p010/robotics/racing-bristlebots)

Procedure PDF Date: 2022-01-13

Experimental Procedure

Building Your Bristlebots

1. Get an adult to use strong scissors or pliers to help you cut the heads off two toothbrushes, one with slanted bristles and one with straight bristles.
2. Follow the instructions in the video or the step-by-step instructions and pictures below to build *two* bristlebots. **Note:** be gentle with the motor wires. They are thin and can rip if you are not careful. You can apply a dab of hot glue at the base of the wires to reinforce them.

https://www.youtube.com/watch?v=Q1zToREgV0c (https://www.youtube.com/watch?v=Q1zToREgV0c)

Step-by-Step Instructions

1. Stick foam tape to top of toothbrush.

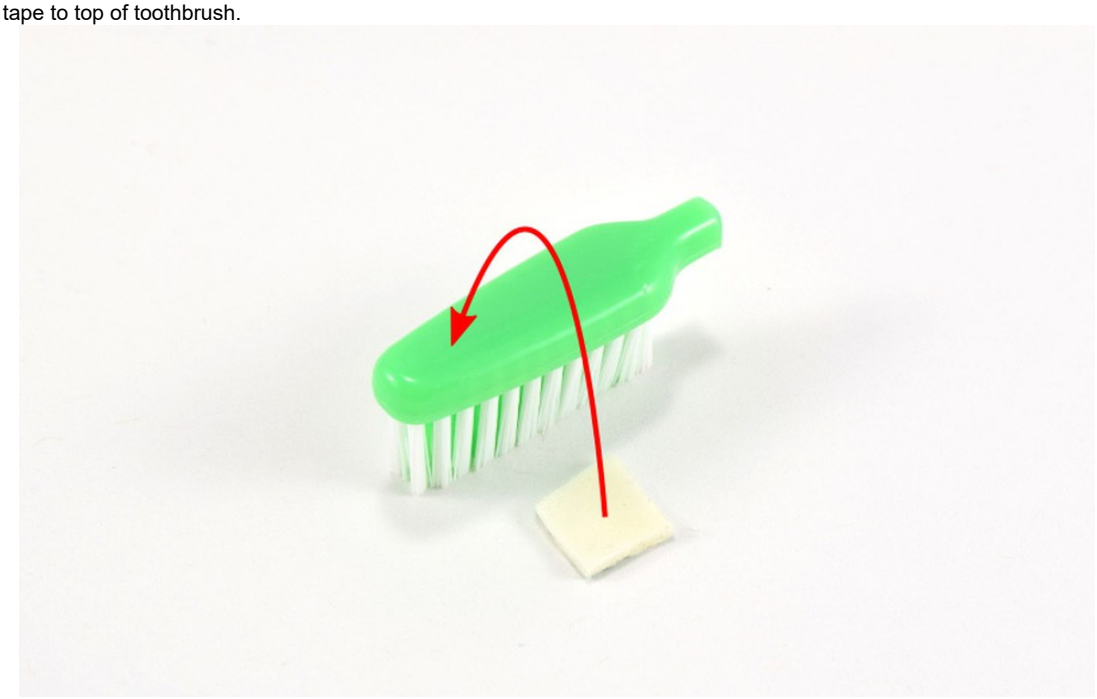

Figure 2. Stick foam tape to top of toothbrush.

2. Peel backing off foam tape.

Figure 3. Peel backing off foam tape.

3. Pull pieces of insulation off ends of battery wires.

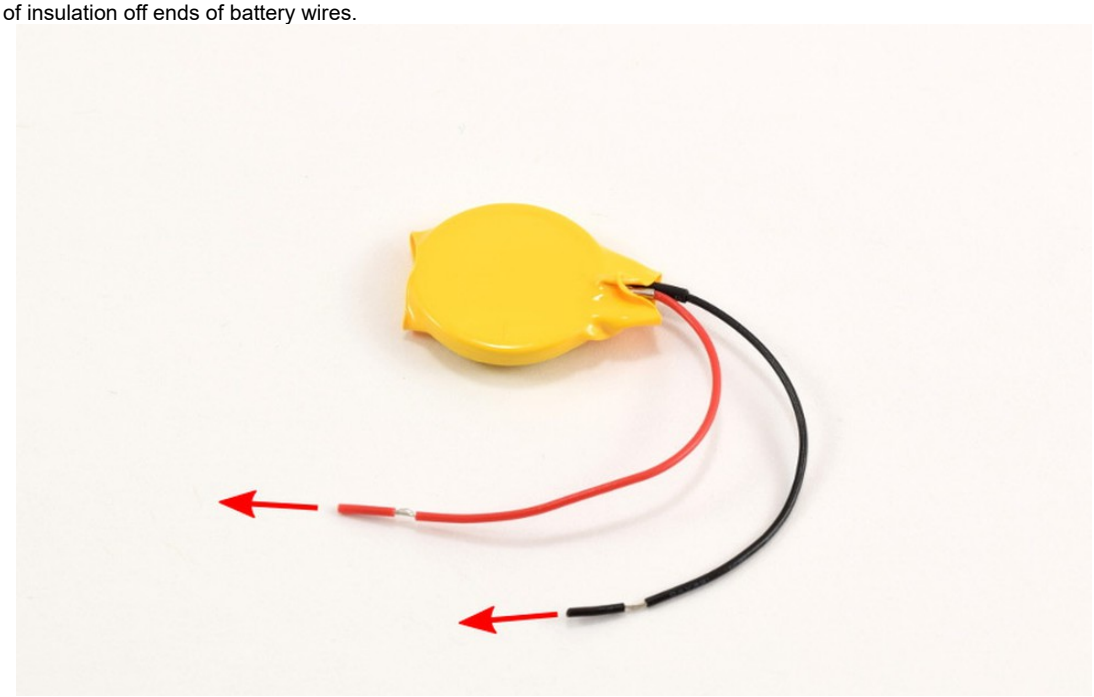

Figure 4. Pull pieces of insulation off ends of battery wires.

4. Battery with insulation pieces removed.

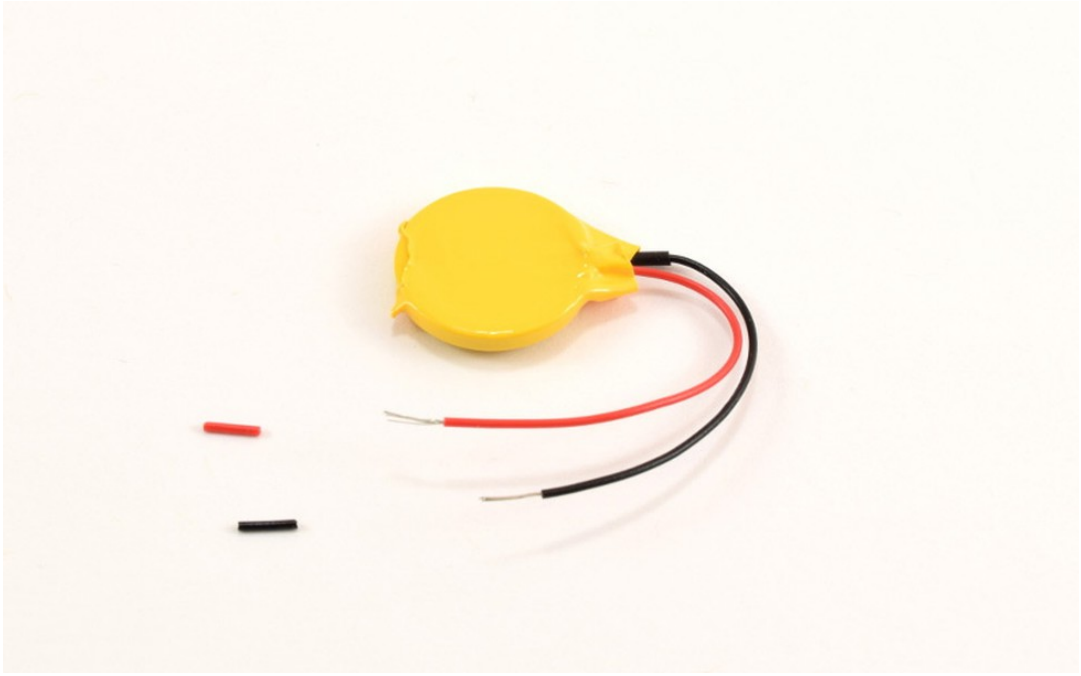

Figure 5. Battery with insulation pieces removed.

5. Attach battery to foam tape.

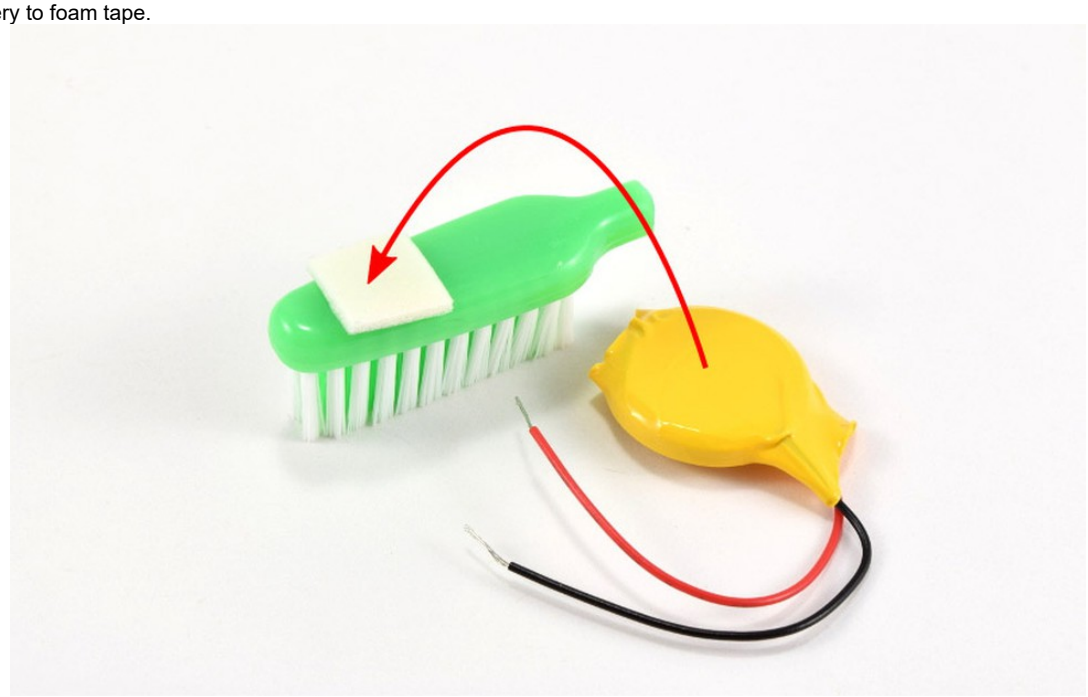

Figure 6. Attach battery to foam tape.

6. Battery attached to toothbrush.

Figure 7. Battery attached to toothbrush.

7. Peel paper backing off motor.

Figure 8. Peel paper backing off motor.

8. Attach motor to toothbrush.

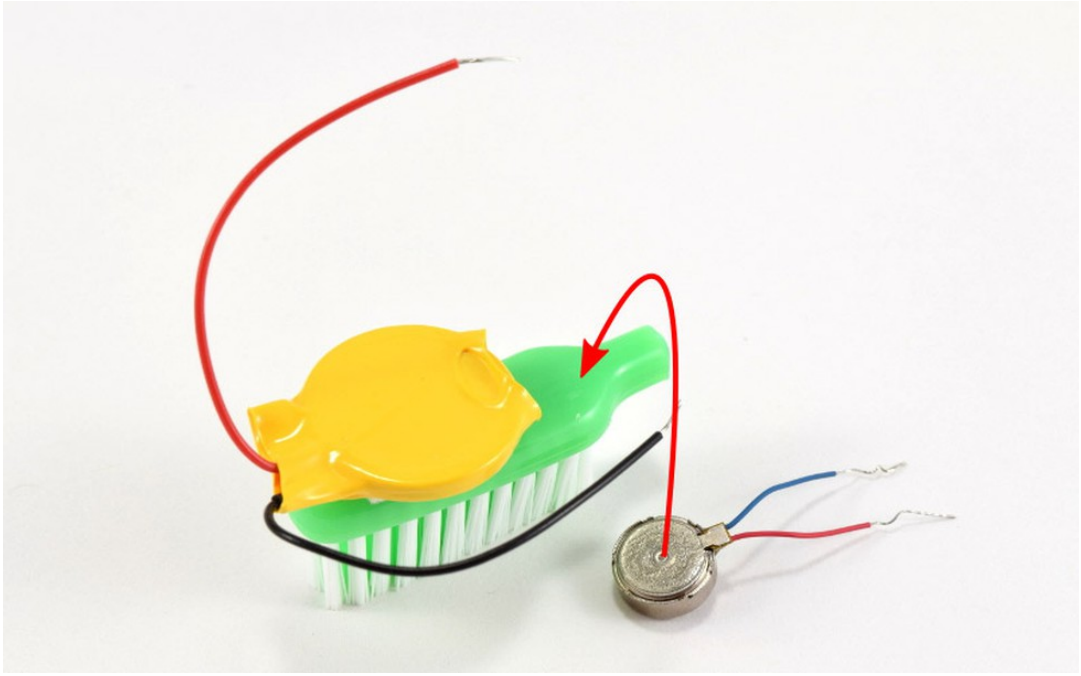

Figure 9. Attach motor to toothbrush.

9. Battery and motor attached to toothbrush.

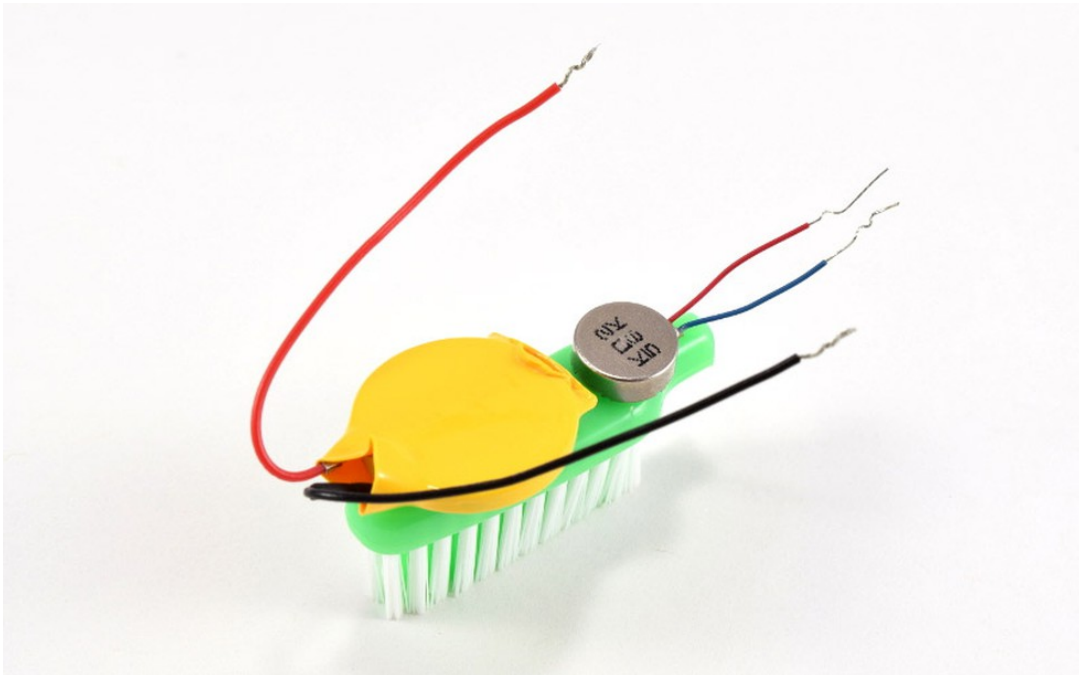

Figure 10. Battery and motor attached to toothbrush.

10. Twist together red wires.

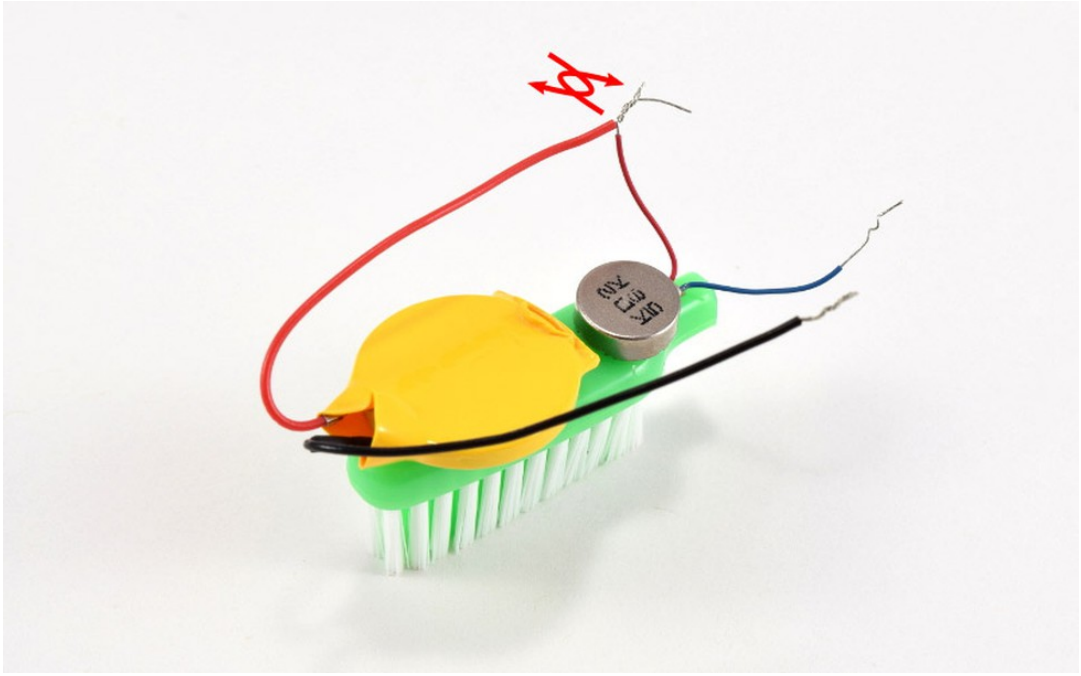

Figure 11. Twist together red wires.

11. Twist together black wires.

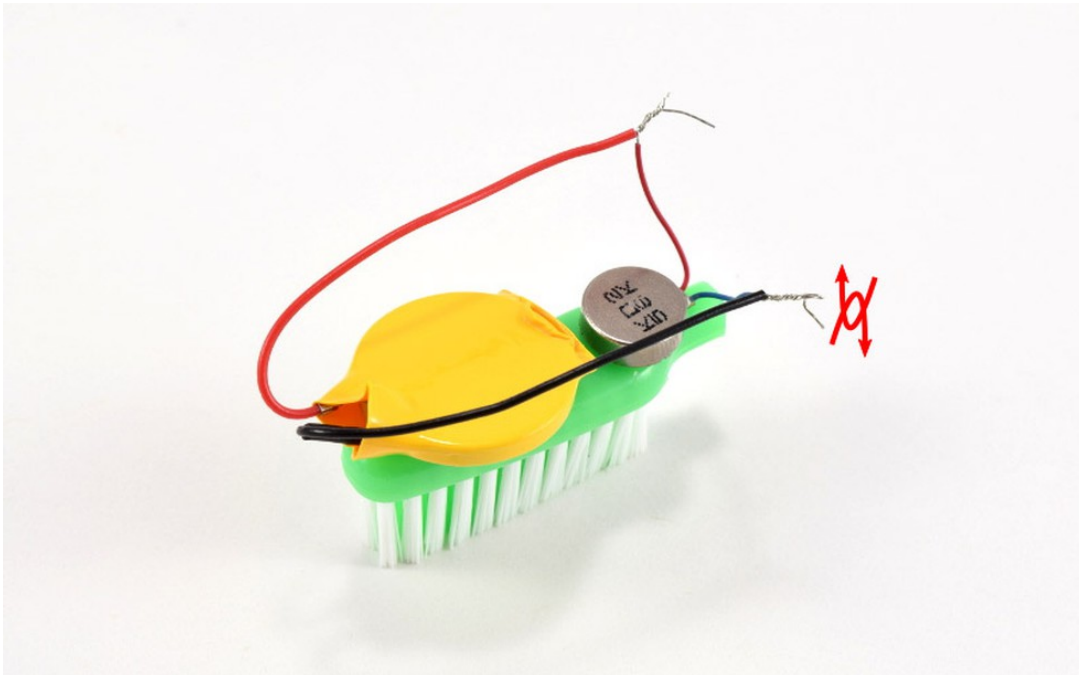

Figure 12. Twist together black wires.

12. Your bristlebot should now vibrate.

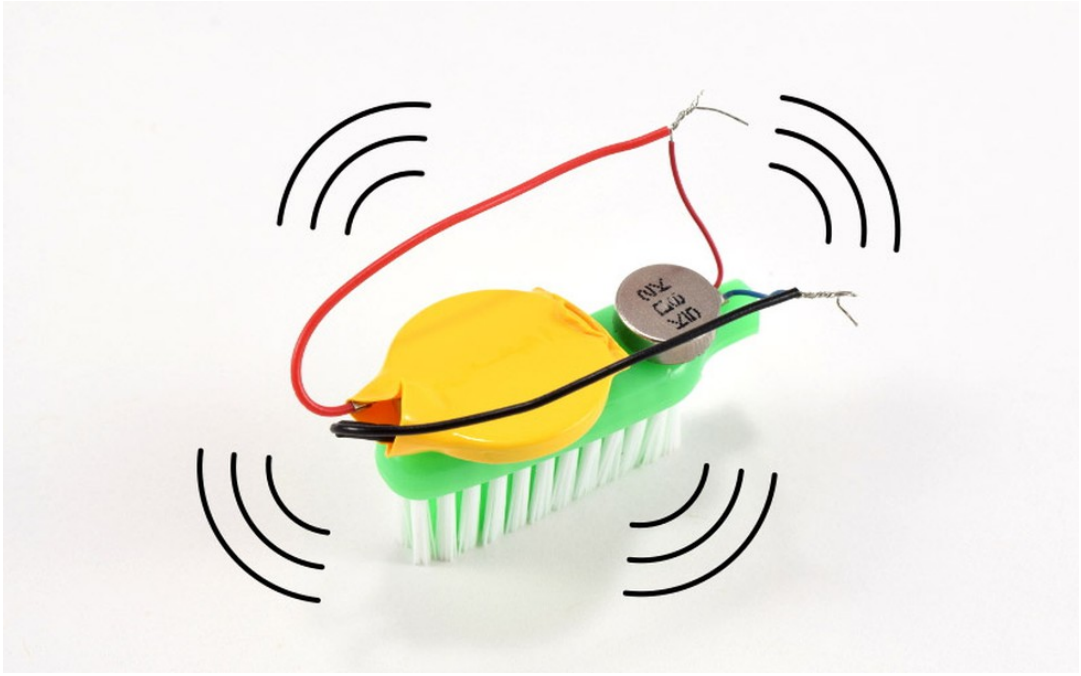

Figure 13. Your bristlebot should now vibrate.

13. Do not let red and black wires touch. This will create a short circuit, quickly drain the battery, and prevent the motor from vibrating.

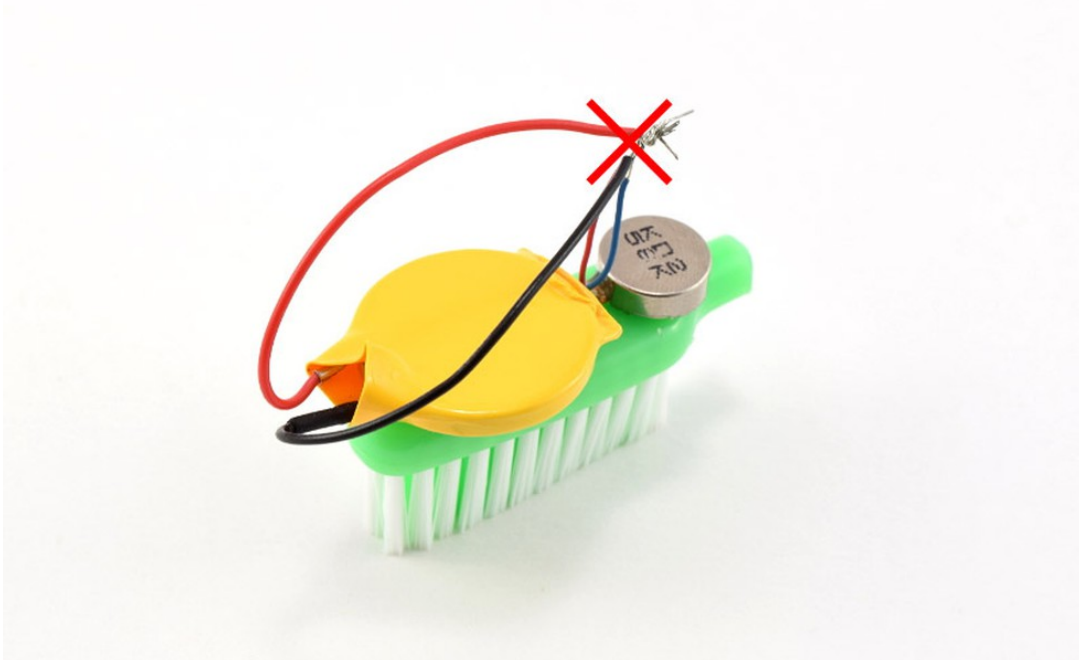

Figure 14. Do not let red and black wires touch. This will create a short circuit, quickly drain the battery, and prevent the motor from vibrating.

14. If your robot stops moving suddenly, make sure the wires did not come loose. Re-twist them tightly if necessary.

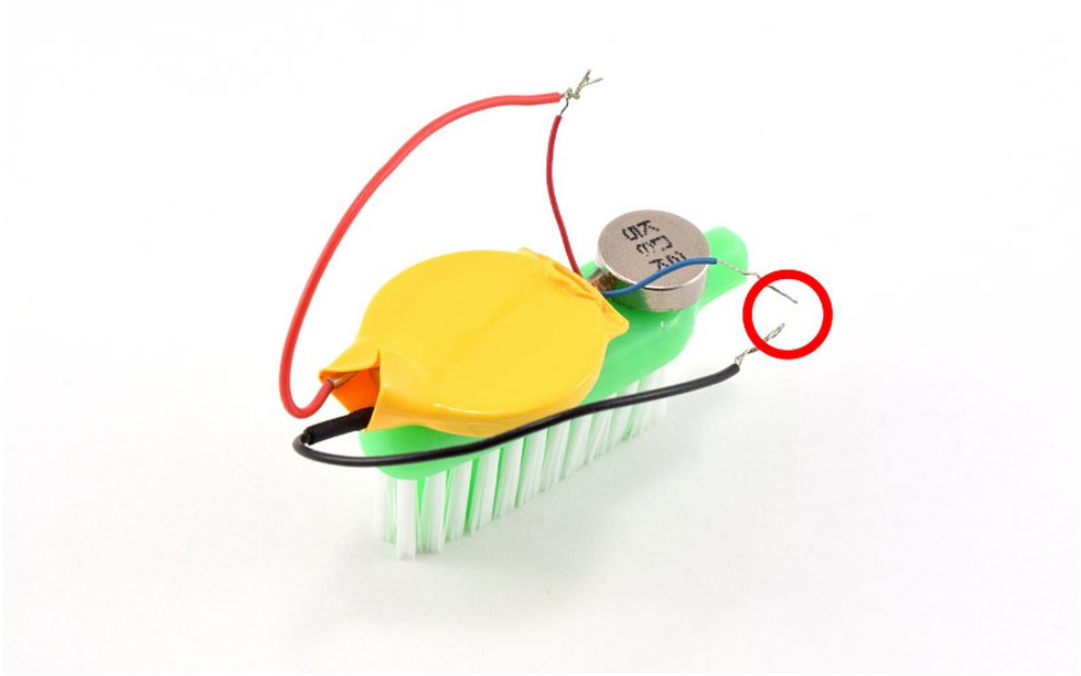

Figure 15. If your robot stops moving suddenly, make sure the wires did not come loose. Re-twist them tightly if necessary.

15. If your robot falls over, make sure the battery and motor are centered on the toothbrush. You can also let it run for 5-10 minutes to drain the battery and it will slow down.

Figure 16. If your robot falls over, make sure the battery and motor are centered on the toothbrush. You can also let it run for 5-10 minutes to drain the battery and it will slow down.

16. Optional: decorate your bristlebot!

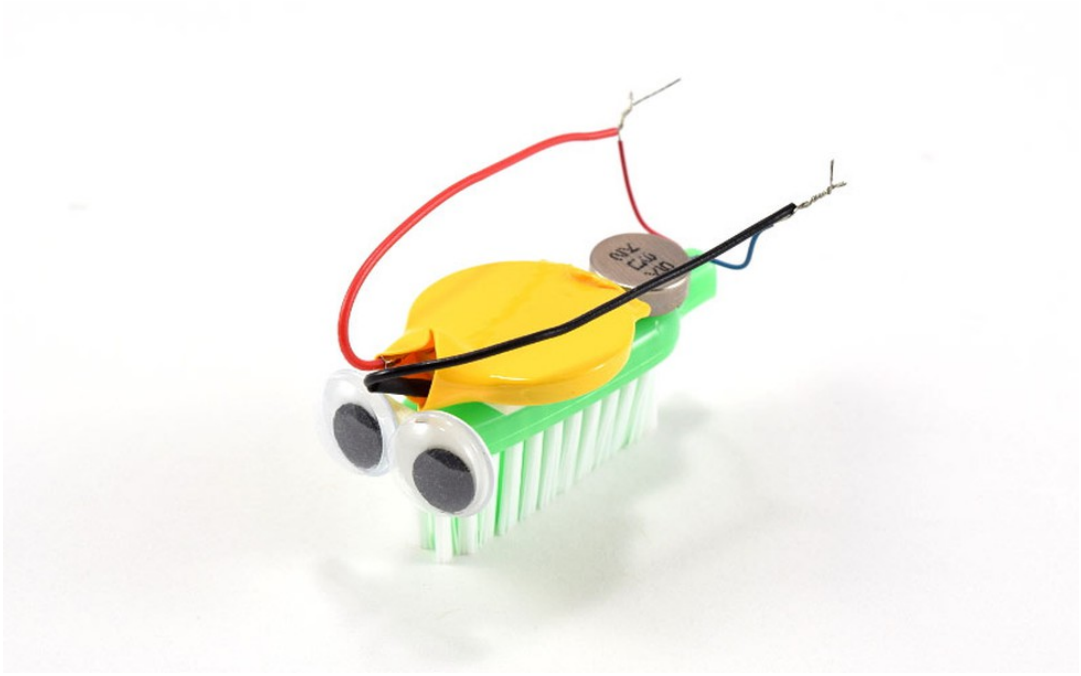

Figure 17. Optional: decorate your bristlebot!

Troubleshooting

1. Do not let the exposed metal parts of the red and black wires touch each other directly. This will create a short circuit and drain the battery very quickly, and will prevent the motor from vibrating.
2. If your robot stops moving suddenly, check to make sure that one or both sets of wires did not come loose. This will create an open circuit and prevent the motor from vibrating. Tightly twist the wires back together if this happens.
3. If your robot falls over a lot, make sure the motor and battery are centered on top of the toothbrush. You can also let the robot run continuously for 5–10 minutes, and it will slow down slightly as the battery begins to drain.
4. To turn your bristlebot off, just untwist one set of wires (you do not need to disconnect both). Make sure you turn your robot off when not in use to conserve battery power.

Racing Your Bristlebots

1. Make a racetrack for your bristlebots by setting up three large books on a smooth, flat surface, as shown in Figure 18. This creates two "chutes" that will force your bristlebots to go straight.

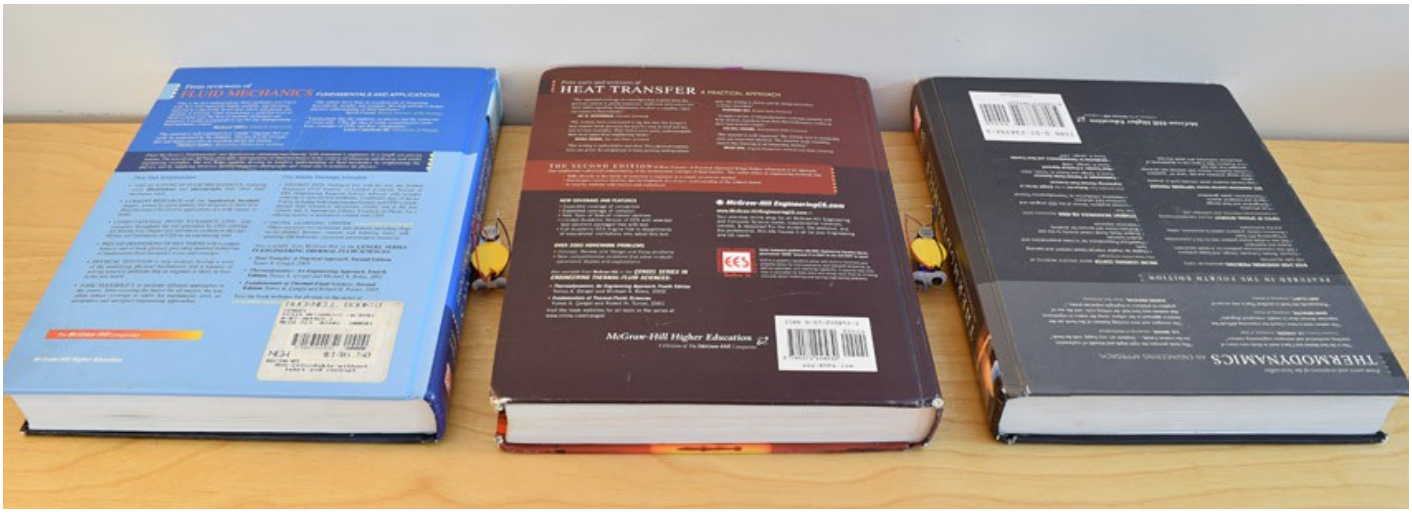

Figure 18. Racing chutes for bristlebots, made using three large books.

2. Get ready to race your bristlebots! Reconnect the wires for each robot to turn them back on.
3. Test your bristlebots in your racing chutes. If the chutes are too narrow, your bristlebots might get stuck. If they are too wide, they might spin around or fall over. Adjust the width of the chutes, if necessary.
4. Pick up your bristlebots and place them side by side in your racing chutes.
5. Let go of both bristlebots at the same time. Watch closely to see which one makes it to the other end of the chute first.
6. If one robot goes backwards, flip it around and start over.
7. Record the winner of the race in your lab notebook.
8. Repeat the race four more times, for a total of five trials. Make sure you record your results in your lab notebook.
9. Optional: Use a stopwatch to record how long it takes each bristlebot to go down the chute. Have a volunteer help if it is too difficult to use

a stopwatch and control both bristlebots at the same time.

10. Analyze your results.
    a. Does one bristlebot consistently win the race?
    b. How do your results compare to your prediction about which type of bristlebot would be faster?

Frequently Asked Questions (FAQ)

FAQ for this Project Idea available online at
https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p010/robotics/racing-bristlebots#help.