



## Art Bot: Build a Wobbly Robot Friend That Creates Art

[https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics\\_p014/robotics/build-art-bot](https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p014/robotics/build-art-bot) ([http://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics\\_p014/robotics/build-art-bot](http://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p014/robotics/build-art-bot))

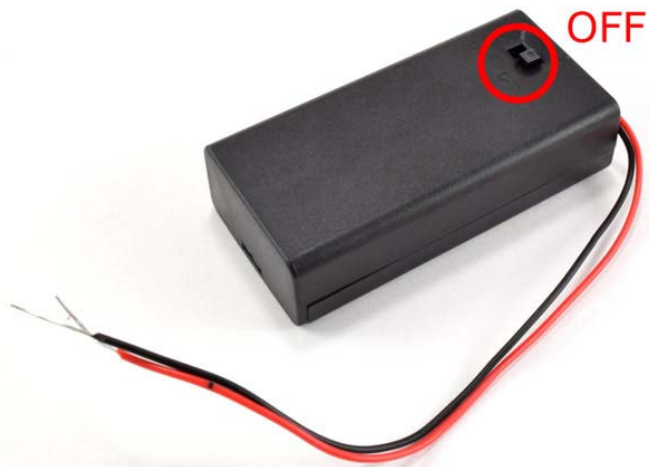
Last edit date: 2018-04-24

### Experimental Procedure

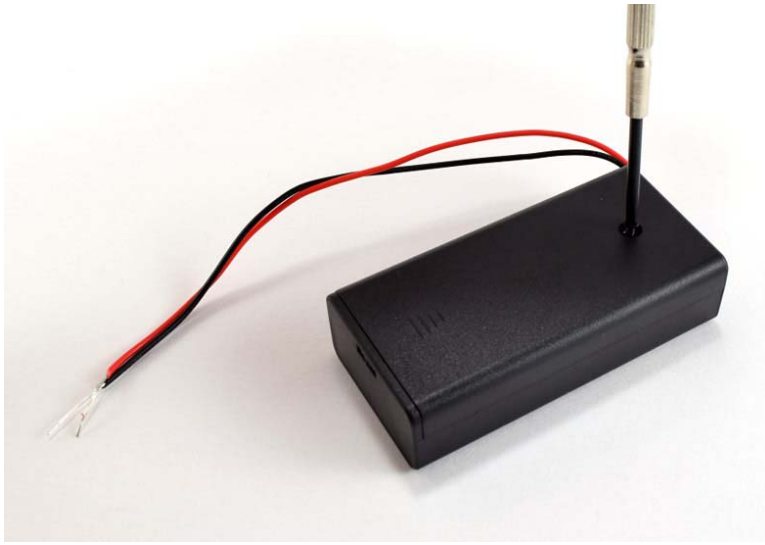
#### Build Your Art Bot

1. Follow along with this [slideshow](#) (#) to build your Art Bot:

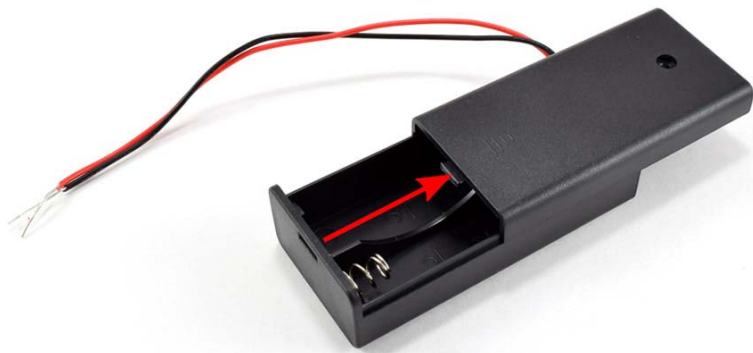
#### Slideshow Images



1. Make sure battery holder switch is in the OFF position.



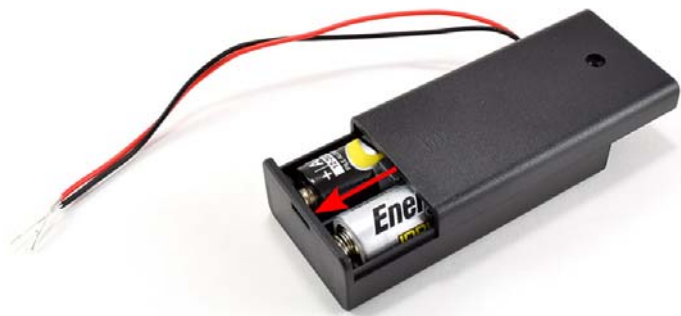
2. Remove screw from battery holder cover.



3. Slide cover off battery holder.



4. Insert two AA batteries into holder. Make sure '+' signs on batteries line up with '+' signs in holder.



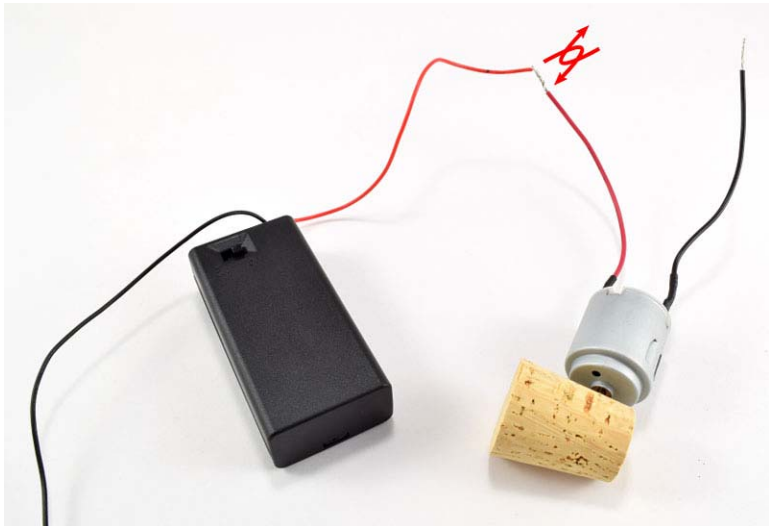
5. Slide cover back on until it clicks in place.



6. Press cork onto motor shaft. Make sure cork is off-center.



7. Cork and motor should look like this.



8. Tightly twist together exposed metal ends of red wires.



9. **Adult supervision required:** Cut three small holes in top of cup, as shown.



10. Thread the motor wires through the two outer holes.



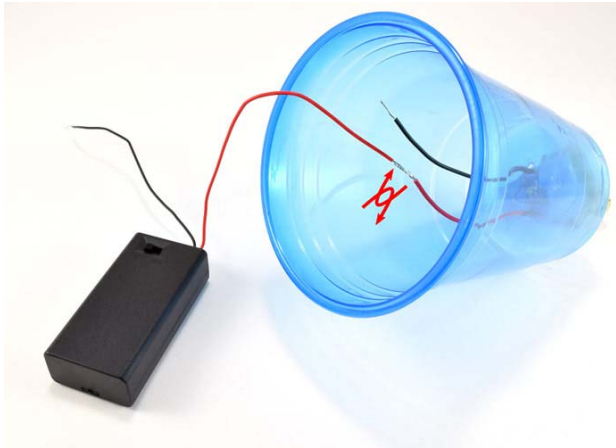
11. Important: The motor shaft sticks out the back of the motor. Make sure it lines up with the center hole so it can spin freely.



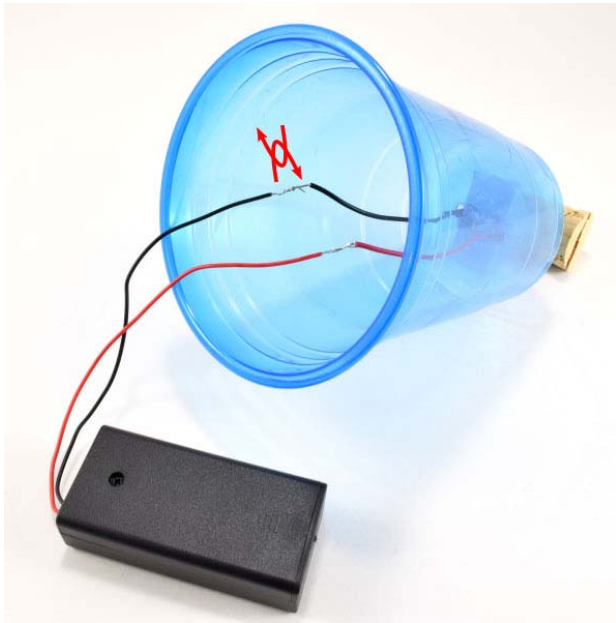
12. Put two pieces of double-sided foam tape on either side of the holes and peel off the paper backing.



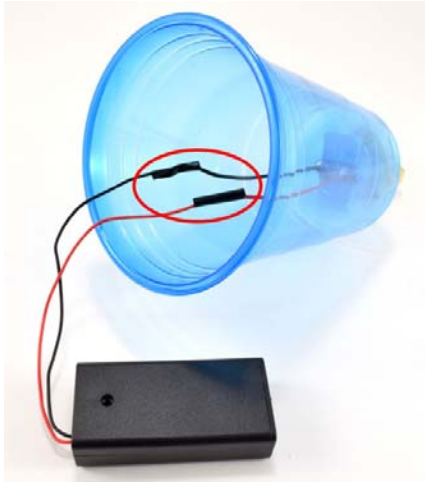
13. Press motor firmly onto tape. Make sure you do not accidentally tape the back of the motor shaft.



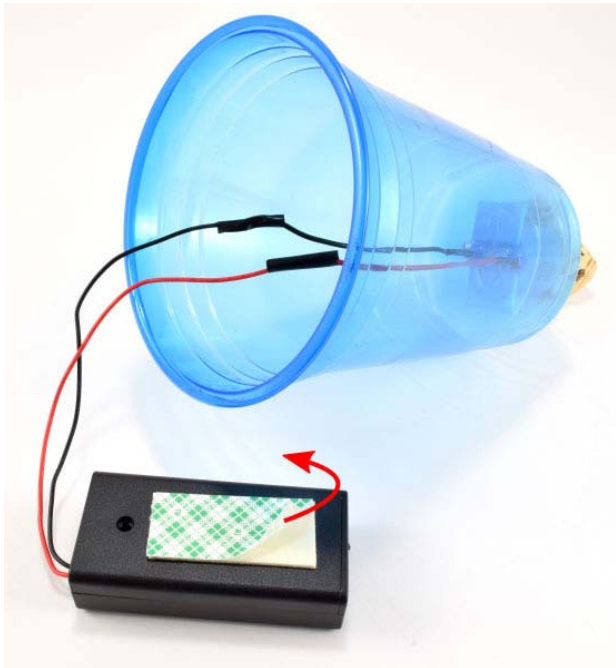
14. Tightly twist together exposed metal parts of red wires.



15. Tightly twist together exposed metal parts of black wires.

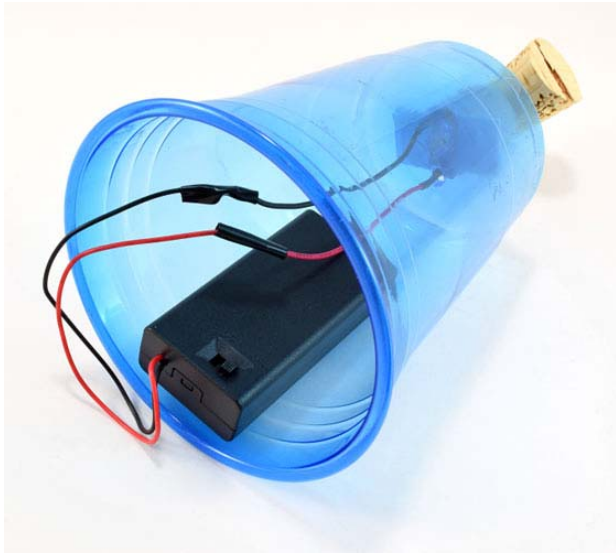


16. Wrap both wire connections in electrical tape.



17. Put a piece of double-sided foam tape on the battery holder (on the side opposite the power switch).





18. Tape the battery holder inside the cup. Make sure the on/off switch is facing toward the rim so you can reach it easily.



19. Tape three markers to the sides of the cup, equally spaced around the edge, to form a tripod.



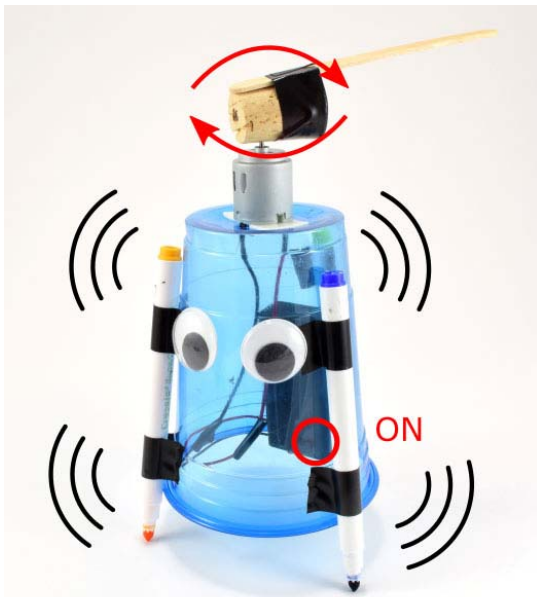
20. Tape a popsicle stick to the cork.



21. Optional: Decorate your Art Bot.



22. Remove the marker caps and place your Art Bot on a piece of posterboard.



23. Turn the power switch to the ON position. The popsicle stick should spin, causing the entire robot to wobble and move around.



24. If the motor does not spin, check that your wires did not come loose. If necessary, tightly re-twist them together.



25. Pieces may fall off your Art Bot as it wobbles around. If necessary, turn the power switch off and re-tape the parts to the cup.

[End of Slideshow Images](#)

2. If you prefer, you can watch a [video](https://youtu.be/daWU2Oh_xlg) that shows how to build your Art Bot.
3. Follow these troubleshooting tips when using your Art Bot:
  - a. If your Art Bot stops moving suddenly, check to make sure that one set of wires did not get disconnected. If you did not twist the wires tightly enough, the vibrations may cause them to come apart. If necessary, take off the tape, tightly re-twist the wires, and then reapply tape.
  - b. As your robot wobbles around, some pieces may fall off. If necessary, use more tape to reattach them.
  - c. Your Art Bot might fall over frequently if it wobbles too much. To make it wobble less, move the popsicle stick so it is more centered on the cork. You may need to adjust the popsicle stick positions you test in the "Test Your Art Bot" section of this project to make sure your Art Bot does not fall over.
  - d. Always turn your robot off when not in use to help conserve battery power.

## Test Your Art Bot

1. Label three pieces of posterboard by writing in their corners: "Popsicle stick off-center," "Popsicle stick partially off-center," and "Popsicle stick centered."
2. Put the first piece of posterboard (popsicle stick off-center) down on the floor or on a tabletop. **Important:** Depending on the surface you are working on, you may need to be ready to catch your Art Bot before it goes off the posterboard. For example, you do not want it to fall off a table, or to get marker on surrounding carpet.
3. Take the marker caps off your Art Bot, and place it in the center of the first piece of posterboard.
4. Have your volunteer get the stopwatch ready.
  - a. Lift the Art Bot up and turn the battery holder's switch to ON. Be carefully that the spinning popsicle stick does not hit your hand!
  - b. Place the Art Bot down in the center of the posterboard. As soon as you put it down, your volunteer should start the stopwatch.
  - c. The volunteer should say "Stop!" as soon as the stopwatch reaches 10 seconds. As soon as they say "stop," pick the Art Bot up and turn it off.
  - d. If the Art Bot goes off the posterboard before 10 seconds is up, pick it up and turn it off.
  - e. If any part of your robot breaks during testing (for example, if a marker falls off), stop testing, fix your robot, and then redo that trial.
  - f. Can you make any observations about the Art Bot's motion? For example, does it seem very jerky and wobbly, or does it move smoothly? Does it move fast or slow? Record any observations you make in your lab notebook.
5. Repeat step 4 two more times, on the same piece of posterboard, for a total of three trials.
6. Now, re-tape the popsicle stick to the cork so it is only partially off-center, as shown in Figure 2.



**Figure 2.** Popsicle stick attached to the cork so it is only partially off-center.

7. Repeat steps 4–5 with a new piece of posterboard.
8. Re-tape the popsicle stick so it is centered on the cork, as shown in Figure 3.



**Figure 3.** Popsicle stick centered on the cork.

9. Repeat steps 4–5 with a new piece of posterboard.
10. Analyze your results by looking at your three posterboard pieces side-by-side, along with the observations you recorded in your lab notebook.
  - a. Which popsicle stick position made the robot move the fastest? Which one made it move the slowest?
  - b. Which popsicle stick position made the robot end up farthest from its starting point within 10 seconds? What about staying the closest to the middle of the posterboard?
  - c. Organize your results in a data table like Table 1.
  - d. Make graphs of your data.
    - i. Make a bar graph with popsicle stick position on the horizontal (x) axis and robot speed on the vertical (y) axis.
    - ii. Make a graph with the popsicle stick position on the horizontal (x) axis and final distance from starting point on the vertical (y) axis.
  - e. Do your results match your predictions about how the popsicle stick would affect the Art Bot's movement?

Popsicle Stick Position	Robot's Speed (fastest/medium/slowest)	Final Distance from Starting Point (farthest/medium/closest)
Off-center		
Partially off-center		
Centered		

**Table 1.** Data table for keeping track of how popsicle stick position affects the robot's motion.

## Frequently Asked Questions (FAQ)

FAQ for this Project Idea available online at [https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics\\_p014/robotics/build-art-bot#help](https://www.sciencebuddies.org/science-fair-projects/project-ideas/Robotics_p014/robotics/build-art-bot#help)  
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