Build Your Own Ruby!

Did you read *The Countdown Conspiracy* and fall in love with Ruby? Do you want your own mechbot to skitter around your room, making you smile while you do homework? Now's your chance to build one!

All it takes is a few materials:

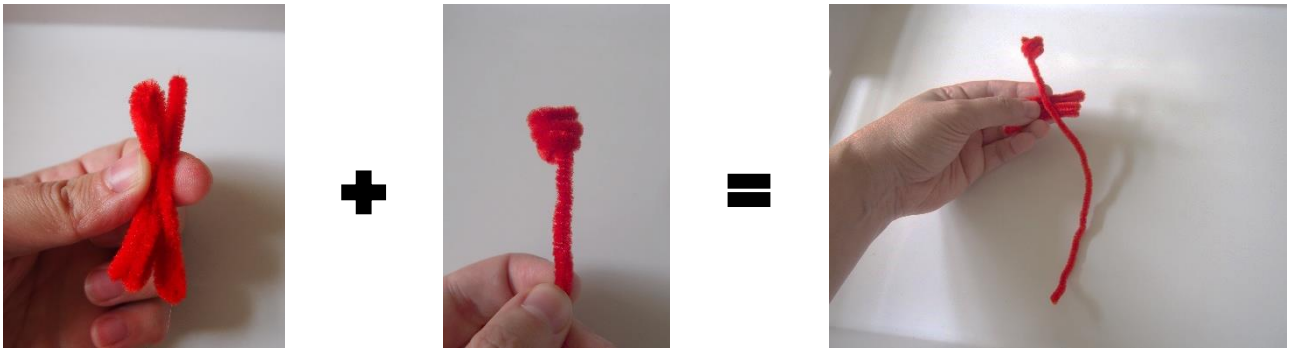
- 1 Coin-Cell Mobile Phone Vibration Motor (inexpensive and easy to find online, though be sure to get one with long wires like pictured below!)
- 1 Coin-Cell 3V Lithium Battery
- 2 pipe cleaners (red for Ruby, but any color can work!)
- 4 inches of electrical tape (again, can be red for Ruby, but any color can work!)
- 1 googly eye
- Glue
- Scissors

Directions

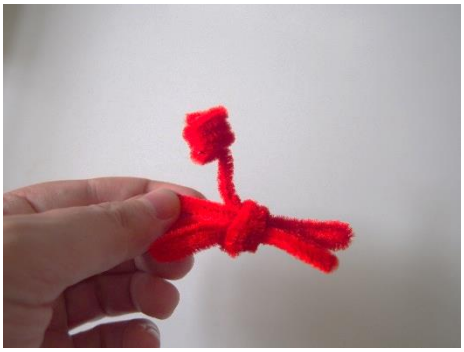
Step 1:

Take a pipe cleaner and fold it into 5 crinkles, as shown. Take the second pipe cleaner and bunch or wrap one end tightly to make a head shape.

Pinch the first pipe cleaner tight so the crinkles come together. Bring the second pipe cleaner to it and wrap it around the first.



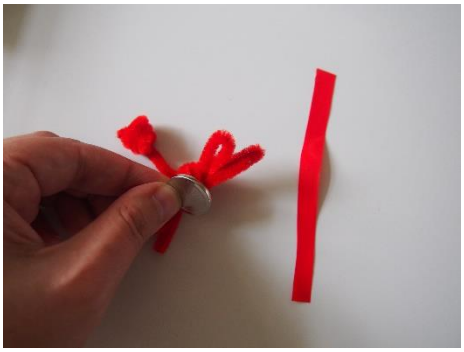
You should end up with something that looks like this:



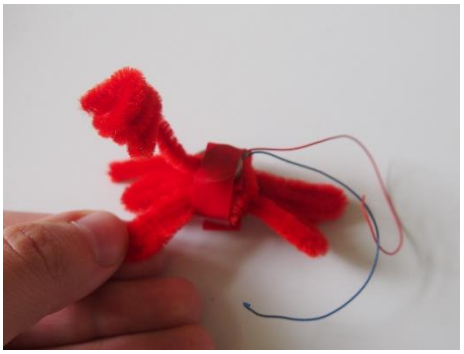
Step 2:

Cut a 4 inch strip of electrical tape (approximately 4 inches is fine, it doesn't need to be perfect!). Then cut it length-wise in half, so you end up with a thinner 4 inch piece.

Take the tape and use it to attach the 3V Lithium battery to the bottom of your robot.

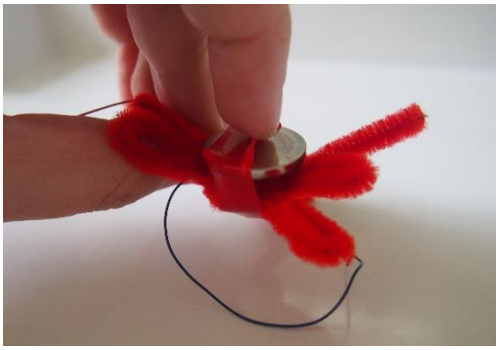


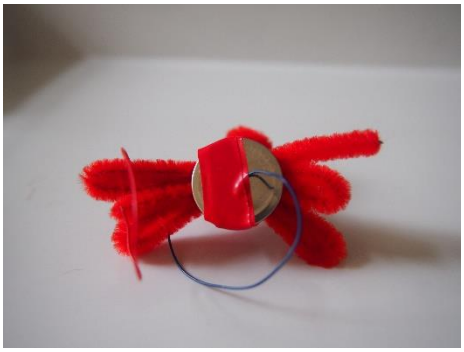
Now wrap the tape around the top and attach the coin cell vibration motor next to the neck of your robot. Hint: bend the neck to the side for easier attachment!



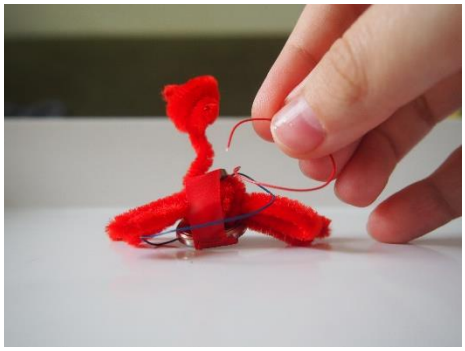
Step 3:

Peel back the tape slightly on the bottom of the battery. Slide in one of the two wire ends from the motor (either wire is fine). Make sure the exposed metal end of the wire is in **direct contact** with the battery. Tape it down tight.





Time to test! Take the other wire and test your robot by touching it to the top side of the battery (the opposite side from the first wire). If it vibrates, it's working!

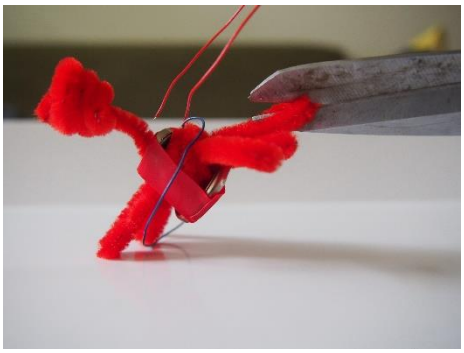


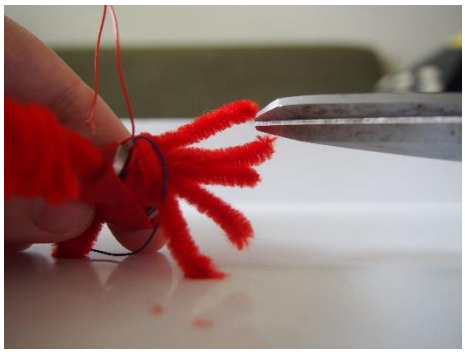
It may not vibrate on your first try! Engineering takes trial and error, as Miranda and Ruby well know. Here are some troubleshooting tips:

- Make sure both wires have their metal tips touching the battery.
- Move the non-taped wire around on the top surface of the battery to experiment with where exactly it makes best contact.
- Double-check the taped wire's connection often, as it may have gotten knocked loose—especially if it did vibrate for a moment or two.
- Don't worry if it takes some time to get both wires touching the battery just right. Practice and patience will pay off! Don't give up!
- If it really, *really* doesn't work, try a different battery or motor. There's always a chance it could just be an old battery or a busted motor.

Step 4:

Time to add the finishing touches! Cut the looped ends of the pipe cleaners so that you have five separate legs for your robot on each side (ten total).





Next, add the googly eye with a drop of glue. Feel free to pose the legs!

Finally, if you want your robot to continuously skitter around, find a good position to secure the second wire to the top of the battery. This can be done by propping it through the pipe cleaner legs or using the tape wrapped around the body to hold it down. This may take some experimentation, so again, patience is key! To pause your robot, simply remove one of the wires from the battery.

Congratulations, you now have your very own miniature Ruby!

Step 5:

Now that your robot is built, try experimenting!

- What happens if you bend her legs to make her pipe cleaners into little “feet”? What happens when you keep them as points instead?
- Can you pose/balance her so she goes in circles? Can you pose/balance her so she goes in a straight line?
- What kinds of surfaces can she skitter over? Which surfaces make her go faster? Which make her go slower?
- Can you design a different robot entirely?
- What happens if you add in another component, like a small LED light?

Miranda constantly builds and rebuilds Ruby, so you’re encouraged to do the same with your little mechbot. Engineers always look for ways to improve and redesign!