

# Let's Make a Motor!

## ACTIVITY N°19

This small DC motor has been built quite successfully by hundreds of students (grade 4 and up) and their teachers. It is very inexpensive, and the necessary materials can be easily acquired. Younger children will require teacher assistance. The completed motor may require some minor adjustments to get it going: that's quite "normal". The Genecon will provide ample voltage to spin the armature at high rate.

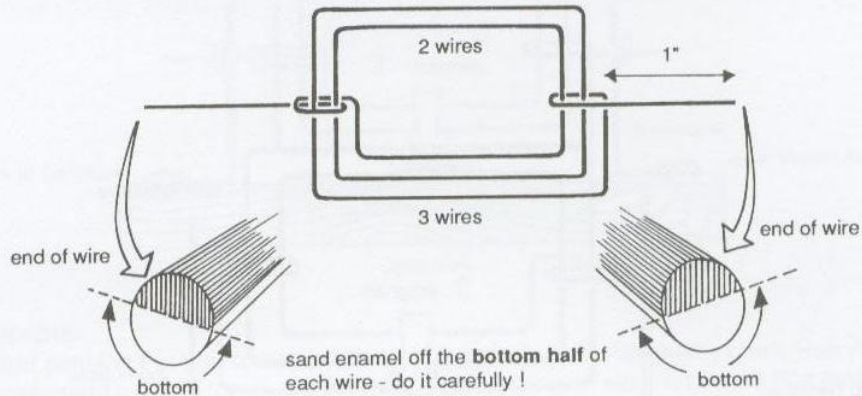
- Materials:**
- \* 45 cm, #24 enameled copper wire
  - \* (3) 1 in. rectangular ceramic magnets
  - \* (2) 10 cm lengths of bell wire
  - \* small block of wood (4 in. long furring strip)
  - \* paper clips, thumb tacks, fine sandpaper

**Procedure (Motor Assembly):**

**1. Making the Armature**

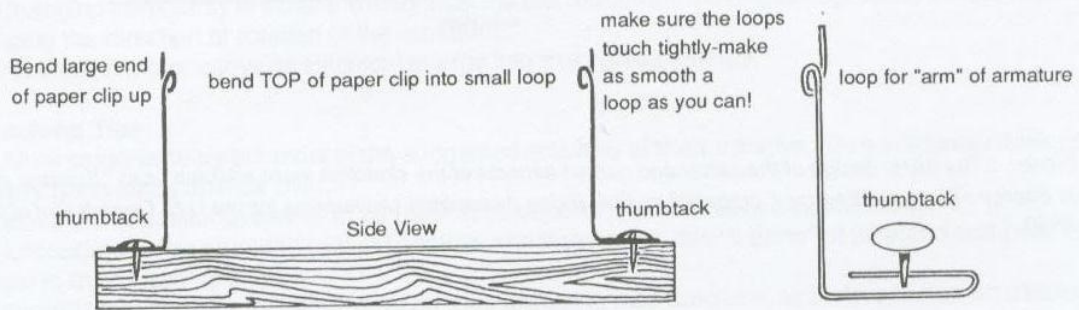
Wind the enameled copper wire into a rectangular coil using the end of the wood block as a mold. Neatness counts! Form the side loops tightly and make sure they are in the center of the sides of the armature coil. See sketch below.

It is important that the clear enamel be removed from **only the underside** of the "arms" of the armature coil.



**2. Making the Motor Base and Support**

Bend two regular paper clips to form the motor supports.



Thumbtacks hold the motor supports (paper clips) to the wood base. The bell wires should be stripped at each end; wrap one end of each wire around and under the thumbtacks.

### 3. Putting It All Together.

The assembled motor should look like this.

The 3 ceramic magnets should be stacked on top of each other.

The armature should spin smoothly and just barely pass over the magnets.

The motor supports (paper clips) must not wiggle around!

### 4. Trying It Out!

Connect the Genecon's leads to the motor's lead-in wires. Generate a current. If the armature does not start spinning, or if it seems to just "tremble", give it a tap with your finger. Most motors will not self-start. Do not keep supplying current if the armature does not spin!

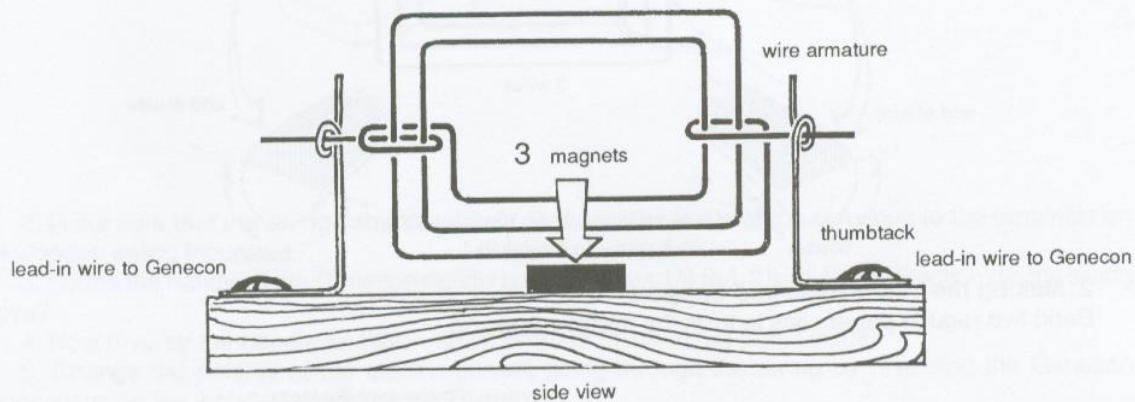
### 5. Troubleshooting: Most motors require some adjusting!

Check to see that the underside of both "arms" has had all the clear insulation removed. You should see bright shining metal along its entire under-surface.

Make sure armature "arms" are not binding against the motor support loops. There should be 1/8 inch clearance on each side for free movement.

Check all metal-to-metal connections.

For Clever Things to do with your motor, see activity #20.



Note: " The basic design of the motor and certain aspects of the sketches were adapted from " Science Activities in Energy : Electrical Energy, " prepared by Oak Ridge Associated Universities for the U.S. Department of Energy, 1980. "