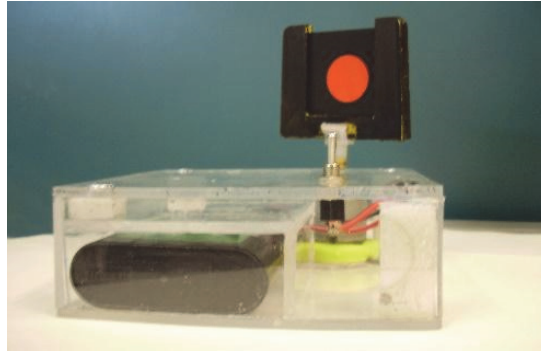


## Colour magic: additive mixing and coloured shadows

# Setup of the box with a motor



Box with a motor Setup  
*Image courtesy of the author*

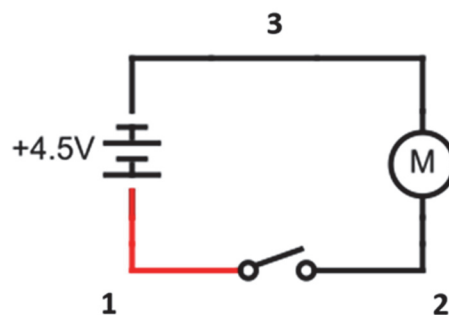
### Materials

The setup shown calls for

- 3–6 V DC motor  
The one shown in the figure is 24 mm in diameter and 29 mm long. The shaft is 7 mm long and 2 mm wide.
- 4.5 V battery
- Cables, red and black
- Brass pulley with a hole the same diameter as the motor shaft
- Binder clip
- Glue
- Methacrylate box with lid
- Plastic or rubber washers (diameter similar to that of the motor)
- Toggle switch
- Two paperclips
- Cutter
- Cable cutter
- Drill
- Welder

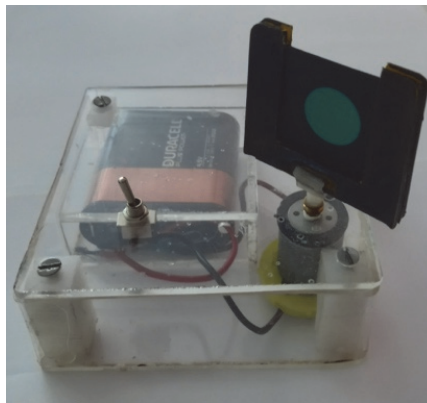
## Procedure

1. Prepare the box and the layout: choose the position of the motor and the toggle switch, and drill two holes in the lid of the box in these positions. The toggle switch should fit through one of these holes, and the shaft of the motor through the other.
2. The plastic washers serve as a support for the motor in the box. One washer serves as the base for the motor. Use the cutter to carve two grooves into it, to make room for the motor's cables, and then glue the washer (grooves downward) to the bottom of the box, so that its centre aligns with the hole made for the motor.
3. Prepare the cabling: measure and cut the cables keeping in mind that 1) a cable (red in the diagram) should go from one battery terminal to one end of the toggle switch; 2) another cable (black in the diagram) should go from the other end of the toggle switch to one motor terminal; and 3) a last (black) cable should go from the other motor terminal to the free battery terminal.



4. Weld the cables to the terminals, while ensuring that the toggle switch is kept in the off position. The cables connecting through the motor will need to be threaded through the grooves in the washer and then welded to the motor terminals. The cables connecting to the 4.5 V battery can be first welded to paperclips, and then clipped onto the battery's metallic flap terminals.
5. Once the cables have been welded to each element, flip the toggle switch to check that the motor spins.
6. Prepare the motor and toggle switch. Place the motor's base on the washer. If necessary, place some washers on top of the motor so that it is held firmly in place when the lid is closed. This should eliminate vibrations. Remove the toggle switch bolt and reassemble through the lid. Screw the lid shut. The motor shaft should now be sticking out of the hole in the lid.

7. Push the brass pulley onto the motor shaft. It should remain firmly in place.
8. Glue the base of the binder clip to the pulley. This will serve as the card holder.
9. Place a card in the clip. (If necessary, reinforce the card for the clip to fit more snugly.)
10. Switch on to verify that the motor spins



The finished box with a motor  
*Image courtesy of the author*