Disc 'Rotography'

LEDs and their light trails (Germany)

Background

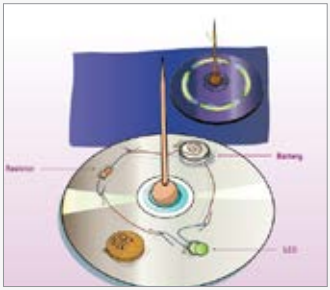
Light trails or 'Persistence of vision' is the commonly used term to describe the optical illusion whereby multiple discrete images blend into a single image in the human mind. It is believed to be the explanation for motion perception in cinema and animated films. Physicist, Otto Lührs, was extremely interested in this phenomenon and created the following experiment.

You will need...

- ✓ 1 Disc
- ✓ 1 Light Emitting Diode (LED)
- ✓ 1 Battery
- ✓ 1 Wooden ball (with hole drilled half way through it)
- ✓ 1 Toothpick (blunted at one end)
- ✓ 2 Short wires (8 cm each)
- ✓ 1 Longer wire (18 cm)
- ✓ 1 Coin (10 c)
- ✓ Double sided sticky tape, sticky tape, glue, scissors and a ruler.

Follow these steps

1. Set up the apparatus as shown (a resistor is not necessary). Place the toothpick into the wooden ball and glue it in place through the hole in the disc.
2. Place some double sided tape on to the disc and place a coil of wire onto it. Press the battery onto the wire coil and stick one of the shorter wires onto the battery with some sticky tape.



3. Now, glue the resistor to the disc and attach it to the short wire (connected to the battery). Connect the other short wire to the free end of the resistor. Connect the LED to complete the circuit. (Ensure the LED terminals are positioned correctly before gluing).
4. Secure a coin across from the battery to ensure the disc is balanced.
5. Spin the disc at various speeds. A trail of light should be seen as a continuous circle when the disc is spun fast enough.

So what happened?

As the disc spins slowly the LEDs can be seen individually. As they begin to spin faster the LEDs appear to blur together and create a continuous circle of light. This phenomenon is known as 'Persistence of Vision' as your brain retains a perception of the LED light for a fraction of a second in your sensory memory. This gives rise to the trail of light that can be seen.

What next?

1. White light could be explored and a Newton's colour wheel could be created.
2. Explore the effect of using more than one LED and varying the colours used.
3. Photographs of the discs can be taken and students can research how exposure time effects the photos produced. The physics of photography could be linked to this experiment.