ELECTRICITY

Builder Level

Purpose

To discover some of the basics of electricity as we make use of part of God's marvelous creation.

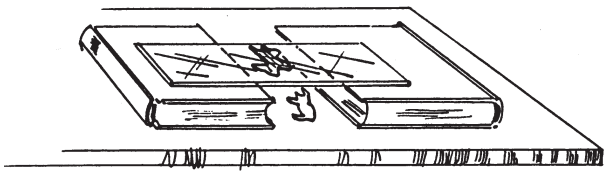
Exploring

1. Learn the following safety rules.

- Do not touch anything electrical when your hands or feet are wet.
- Never run an electrical cord under a rug where you can't see it.
- Always switch off the power-point when you plug in or unplug a cord.
- Never fly a kite near electrical transmission lines or during an electrical storm.
- Never swim, stand under a tree or near a pole during an electrical storm.
- Always put the light switch in the 'off' position when changing a globe.
- Never spray water on a fire in electrical or electronic equipment.

2. Static Electricity

In the year 600 BC 'Thales of Milete' discovered that when he rubbed a piece of amber it could attract pieces of small light material (amber means electron).
This also happens with rubber, some plastics and glass.
Discover this for yourself by placing some small snippets of paper underneath a sheet of glass resting on two books.



Rub the glass with silk or flannel. Discuss what happened with your counsellor.
Note: The glass becomes electrically charged and attracts other materials that are neutral or have an opposite electrical charge.
Negative charge (–) = Too many electrons.
Positive charge (+) = Not enough electrons.
What happens after you walk across a wool rug and touch a door handle?
Discuss with your Counsellor.
Note: By rubbing your feet on the rug your body becomes electrically charged, sometimes high enough to make a spark jump from your hand to the door-handle giving you an electrical shock (which is harmless).

3. Current Electricity

When you pump up a tyre, air will flow from the pump where there is lots of pressure through the hose into the tyre which has lower pressure. Similarly when you switch on a torch, an electron current will flow from the negative (–) connection of the battery where there are lots of electrons through the wire and the bulb to the positive (+) connection where there is an electron shortage.
Materials that allow electron current to flow easily are called conductors.
e.g. All metals; copper, silver and aluminium etc.
Materials that allow none or very little current to flow are called insulators.
e.g. glass, rubber and plastic.

Resistors: A resistor resists the flow of current through an electrical circuit. Similarly, when you change the bath-tap from a high to a low setting, less water will flow through the tap. The more the resistance, the more it slows down the current.

Diode: A diode allows current to flow in one direction but not in the opposite direction. Similar to a tyre valve that allows air to pass only one way. A special kind of diode gives light when current passes through it. This is called a Light Emitting Diode or a LED.

List below as many LED displays as you can.

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4. Electronics: where it is used.

SOME EXAMPLES

Musical Instruments
- Electronic organ

Exchange and store information
- Computer
- Navigation
- Defence

Control
- Light dimmers
- Electronic ignition

Exchange and store pictures and sound
- Broadcasting
- Records, tapes and discs
- Videotapes

List more examples.

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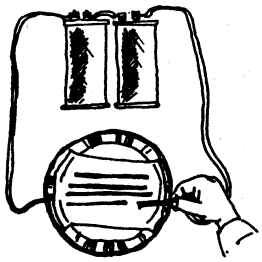
5. Write down the meaning of the following terms.
- Static electricity
- Current electricity
- Direct current
- Alternating current
- Magnetic field

Doing

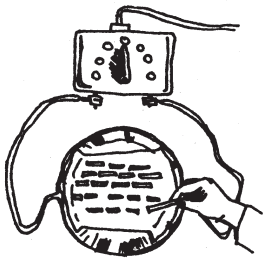
To find out about current electricity use:
- one resistor (220 ohm, ½ watt)
- two LEDs
- one lantern battery
- one electric train transformer

1. **Dlrect Current** Twist the short wire of one LED to the long wire of the other LED, twist together with the resistor wire and connect the resistor to the middle connection (–) of the battery. Twist the other wires of the LEDs together to a piece of copper wire and twist to the outer connection (+) of the battery. One LED should light up.

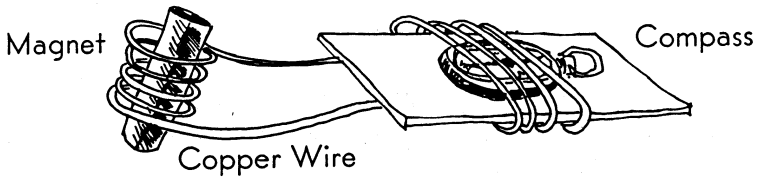


Disconnect the battery, connect the resistor to the outer connection (+) and the diodes to the (–) connection.
The other LED should now light.

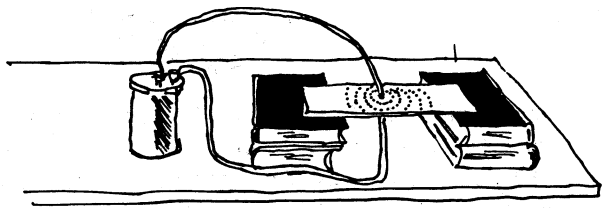
2. **Alternating Current** Disconnect the battery and connect the resistor to one connection and the wire from the LEDs to the other connection of a train transformer. Both LEDs should light.



Discuss with your Counsellor why this happened.
Note: For direct current, one LED conducts and gives light, because it is connected in the forward direction, the other is connected in the reverse (non-conducting) direction. For alternating current the direction of the current alternates very fast and it appears that both LEDs are alight.



3. **Generator** Wrap a piece of copper wire around a compass and around a magnet as shown below. Move the magnet back and forth, and the needle of the compass will move as well.



4. **Electromagnet** Place a piece of cardboard on a table suspended between two stacks of books. Run copper wire up through the centre and attach it to a six-volt dry cell battery. Place iron filings on the cardboard. Tap the cardboard lightly with your fingers, and the iron filings will form a magnetic field around the wire.

Ask your Counsellor to sign below and arrange for the presentation of your badge.

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