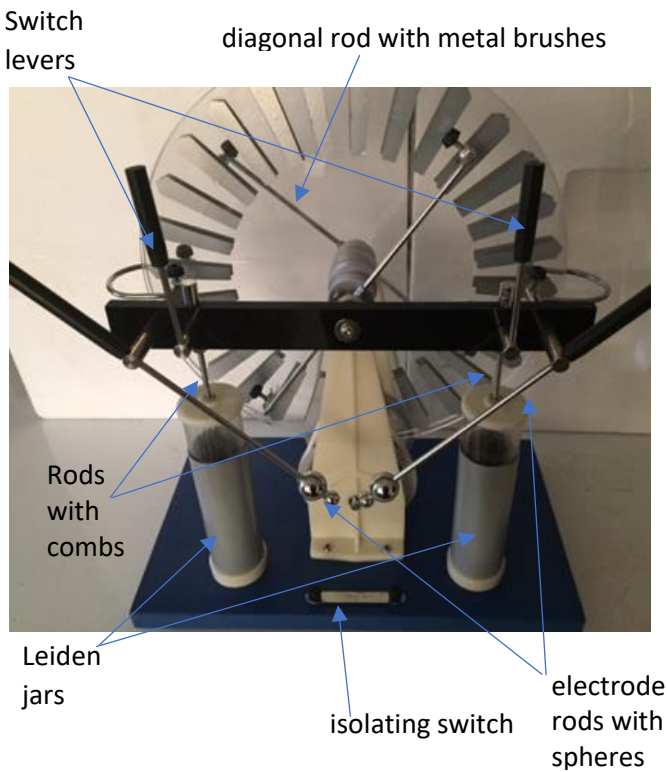


WIMSHURST MACHINE

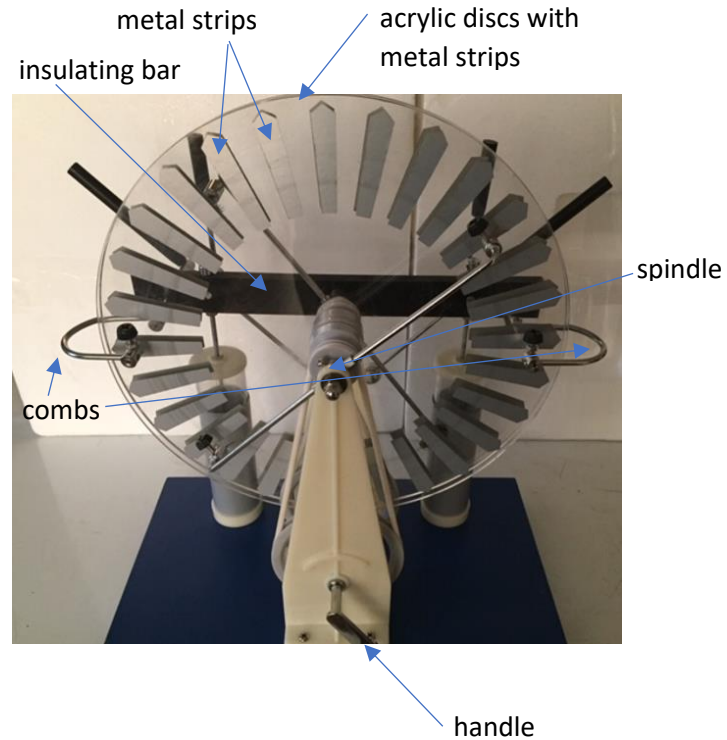
The Wimshurst Machine, a voltage and spark generator, was created between 1880 and 1883 by British inventor James Wimshurst (1832–1903).

DIAGRAM OF PARTS

FRONT (face towards audience)



BACK (face towards demonstrator)



SAFETY INSTRUCTIONS

1. Do not operate the machine near sensitive electronic equipment (computers, mobile phones, etc) or they could be damaged.
2. Do NOT touch any of the metal parts of the machine when in use, particularly the combs (semi-circular loops on each side) and the metal rods and/or spheres.
3. After generating sparks, touch the two electrode rod spheres together to ensure any metal parts are discharged.
4. During use, it is normal to notice a burning type smell. This is the ionization of some of the surrounding oxygen in the air (O_2) into ozone (O_3).

ISOLATING SWITCH

The isolating switch is the metal bar with two black knobs, found on the front of the Machine. Machine should be supplied with the switch closed. Leave the switch closed for normal operation.

To open the switch, unscrew the left black knob anticlockwise, then the switch bar will slide forward to break the connection between the Leiden jars.

To close the switch, slide the bar back under the left knob and tighten it clockwise.

SETUP INSTRUCTIONS

The Wimshurst Machine is supplied almost ready for use.

1. Attach the handle (supplied) into the screw hole on the lower back of the Machine.
2. Check that the position of the diagonal rods is from upper left to lower right at an angle of 45° to the insulating bar as viewed from the back (equipment should be supplied this way), and that the switch levers are in the vertical position.
3. Make sure the isolating switch is closed. The switch is closed when the metal bar is firmly clamped with both black knobs tightened. It should be supplied this way.
4. Make sure the metal brushes are making good contact with the metal strips (see closeup photo on right). It may be necessary to adjust them slightly using the black screw threads on the brushes or the silver screw threads close to the spindle (axle) to ensure good contact.



OPERATING INSTRUCTIONS

1. For best results, use a darkened room.
2. Set the electrode rods so the spheres are between 0.5 – 3 cm apart. The rods can be loosened by turning the black handles anticlockwise and tightened by turning clockwise.
3. With one hand on the base of the Machine for stability, turn the handle CLOCKWISE quickly. You will very quickly hear and see a bluish violet spark being generated between the two spheres.
4. It's a good idea to touch the two electrode rod spheres together after use to ensure all metal parts are discharged.

HOW IT WORKS

The Physics behind the operation of the Wimshurst Machine is quite complex, even much more so than what is explained here! Essentially, the contact between the metal brushes and spinning metal strips on the oppositely spinning discs causes the electrostatic induction of positive charge on one half of each disc and negative charge on the other half of each disc. Charge is transferred from the metal strips to the Leyden jars (which are like capacitors and store the charge, one becoming negatively charged and the other positively charged). The two double spheres act like a third capacitor, building up positive charge on one sphere and negative charge on the other. Air is a poor conductor, but the strong electric field produced between the spheres ionises the air, producing plasma which does conduct, and provides a path for the electrons to flow from the negative electrode to the positive electrode (allowing us to see the spark). This is similar to what happens with lightning.

CLEANING & STORAGE

1. Dust on the Machine can inhibit electrostatic charging. Keep the Machine in its box or in a clean, dust-free area (eg. cupboard) when not in use. Do not expose to direct heat. (sunlight or heaters).
2. If the discs become dirty, clean carefully with a damp paper towel. Avoid chemical solvents as they can damage the discs. Rubbing alcohol (available from a hardware store) can be used to remove any oils or grease on the disc which may come from the spindles.
3. To remove the handle for storage, hold the discs steady and unscrew the handle ANTICLOCKWISE.