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# ONTARIO **SCIENCE** CENTRE



## Exhibit Inquiry **Energy Transformations**

Grade 4-8

An agency of the Government of Ontario



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Have students look for the following exhibits related to electricity and energy transformations during their visit to the Ontario Science Centre:

## Plasma Ball

Where to go:

Science Arcade (Level 6)

*Plasma-Ball*



What it's about:

The Plasma ball converts electrical energy to light (and heat and sometimes even sound!) The ball is filled with gas that surrounds an electrical source. Electricity flows out from the centre, energizing the gas and making it glow. The glowing gas is called "plasma". Students love the Plasma Ball, making it the perfect tool to practice with the scientific inquiry process and to hone observation skills.

Encourage students to come up with a question about the ball and a hypothesis to answer the question. Ask them to make a prediction based on their hypothesis, then to test that prediction. For example, for the question, "what happens when I touch the ball?" the hypothesis could be, "the plasma always goes to the spot where I touch." A prediction could be: "No matter where I touch the ball, the plasma will always go towards my hand." A test may reveal that the plasma is less likely going to a spot low on the ball. Students may have to modify their hypothesis.

Explore the properties of current electricity. Electrical current is often compared to water flow. Current is the amount of flow; voltage is like water pressure; conductors are holes through which water can flow and insulators stop water from flowing. With the plasma ball, your body works as a water hose from the high pressure ball to the ground.

What to say and do:

- What forms of energy does the ball have? (*e.g. Light, heat, electricity, sound, movement.*)
- Will the plasma go to your hand no matter where you place it? (*No, the plasma is less likely to go to the bottom of the ball.*)
- Does it matter who touches the ball? What could cause a difference? (*The easier it is for electrical charges to flow to a spot, the more plasma will flow to that spot.*)
- Make a chain of students by holding hands and see whether that affects how much you can control the Plasma.
- Get everybody to step away from the plasma ball. Describe what is happening to the plasma.
- Is electricity passing through the glass? Is glass a good insulator? (*Even good insulators are not perfect, so at high voltages some charges will pass through glass.*)

## Exhibit Inquiry

# Energy Transformations

## Pedal Power: Bicycle Generators

Where to go:  
Science Arcade (Level 6)  
*The Bicycle Generators*



What it's about:

The bicycle generator transforms a rider's mechanical energy – the power of pedalling – to generate electricity. The electricity powers a bank of light bulbs, allowing a television camera to show the rider on a television screen.

What to say and do:

- Can you pedal your way to fame on television? Light up a bank of lights with your pedal power! Try out the bicycle generators and see what your body's mechanical energy can do.
- Explain how you are able to use your body's energy to run the lights. (*The blue cylinders at the front of the bikes are generators which convert the body's mechanical energy to electrical energy.*)
- Can you make the picture on the television brighter? Light up all the lights? What do you have to do to make this happen? (*Pedal faster.*)
- Do you notice another kind of energy being created as well as light? (*Heat – the more lights, the hotter it feels. And you'll feel hot too as you work so hard!*)
- Do you think this is an efficient way of producing electrical energy? Explain why or why not.

## Electricity Show

Visit the Electricity show in the Science Arcade on Level '6'.



Duration: 20 minutes  
Demonstration times are listed on the schedule boards and video monitors throughout the building.

What it's about:

What is electricity, anyway? The electricity show answers the questions "What types of electricity are there?" and "How is electricity in our homes produced?" and covers many of the basic topics in the Grade 6 (Electricity and Electrical Devices) curriculum.

What to say and do:

- Watch the show and ask students if they can give examples of static electricity in their everyday lives. (*e.g. - clothes in the dryer, rubbing a balloon on your hair, sock feet on carpet*)
- How are current and static electricity different? (*Current electricity is the kind we use in our homes. Static electricity is caused by friction.*)
- What causes your hair to stand on end when touching the Van de Graaf generator? (*The generator charges your entire body and hair with the same positive charge. Since equal charges repel, your head and hair repel each other.*)
- What are ways you can conserve electrical energy? (*Turning off lights, hanging clothes to dry, keep air conditioner at 25° C in the summer, etc.*)

# Energy Transformations

### Vocabulary

<b>Attraction</b>	A force that acts to bring objects together. The opposite poles of a magnet attract each other.
<b>Battery</b>	A chemical source of electricity.
<b>Circuit</b>	An electrical device that provides a path for electrical current to flow.
<b>Conductivity</b>	The ability of a substance to transmit electricity or heat.
<b>Conductor</b>	A substance that can transmit electricity or heat.
<b>Current</b>	A movement or flow of electricity.
<b>Electrical energy</b>	Energy made available by the flow of electric current through a conductor.
<b>Electromagnet</b>	A device that creates a magnetic field when an electric current is passed through a coil of copper wire wrapped around an iron core.
<b>Galvanometer</b>	An instrument for measuring electrical current by means of its magnetic effects.
<b>Generator</b>	A machine that changes mechanical energy into electrical energy.
<b>Insulator</b>	A substance that does not transmit electricity or heat very well.
<b>Magnet</b>	A piece of iron or other material that has the property of attracting similar objects or aligning itself in an external magnetic field.
<b>Magnetic field</b>	A region around a magnet within which the force of magnetism acts.
<b>Magnetism</b>	The property displayed by magnets which results in attraction or repulsion between objects. Can be produced by the motion of electric charges,
<b>Motor</b>	A machine that changes electrical energy to mechanical energy.
<b>Repulsion</b>	Forces that act to move objects apart. The like poles of a magnet repel.
<b>Static electricity</b>	Electricity that consists of isolated motionless charges.
<b>Superconductivity</b>	The disappearance of electrical resistance at very low temperatures.

### Internet Links

Electricity (Concepts) Theme Page  
[www.cln.org/themes/electricity.html](http://www.cln.org/themes/electricity.html)

**PLEASE NOTE:** Programs and exhibits are subject to change without notice.