

Grade 7 Activities for Exhibit Exploration

This worksheet will help guide you as you investigate our exhibits.

Time to Complete: 2 hours

SPACE (ENTRANCE): Level 4

A. FORM AND FUNCTION

1. Find the **space shuttle model** outside of the space hall.
 - a. After lift-off, the large cargo bay doors behind the cockpit open directly to the outside of the shuttle. These doors need to open, even if the shuttle is not carrying any cargo.

Why do you think this might be?

(Hint: Look at the picture of the cockpit. Have you ever felt a computer after it was on for a long time?)

The computers and other machinery radiate a great deal of heat. It is necessary to open the cargo bay doors to allow the heat to escape.

- b. The shuttle becomes very hot when it re-enters the Earth's atmosphere. Can you see the insulating tiles that protect it? Take a picture of them if you have a camera.

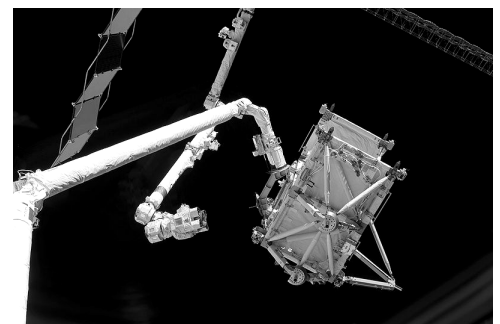
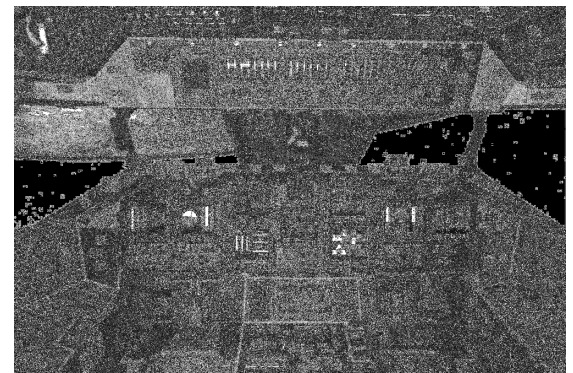
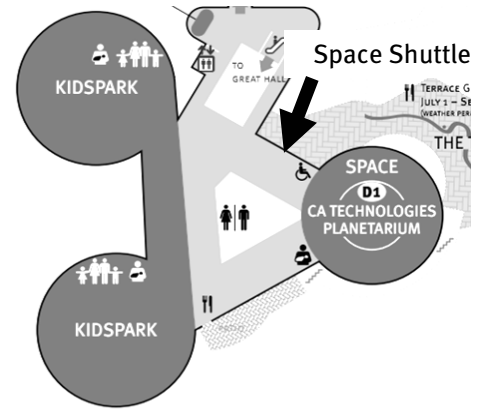
Would an airplane need similar protection? Why or why not?

An airplane would not need similar protection, because it flies more slowly and at significantly lower altitudes than a spacecraft at re-entry.

- c. Find the Canadarm inside the space shuttle.

The arm's motors are unable to lift even its own weight on the ground, but the arm can lift massive payloads in space. Why might this be?

When the space shuttle is orbiting Earth, it is in freefall. So although the mass of the Canadarm remains constant, in microgravity, it is weightless.



SCIENCE ARCADE: Level 6

2. Find the **Flywheel Momentum** exhibit.
 - a. Find a friend, and choose two flywheels with the **same diameter**.

Record the mass of each wheel, and the material each is made of:

Flywheel #1 **answers will vary** Flywheel #2 **answers will vary**

With your friend, spin each wheel for 10 seconds. Make sure you both start and stop spinning at the same time. After you let go of the wheels, which wheel continues to spin longer? Circle your answer above.

The flywheel with the larger mass should spin longer.

- b. Now, choose two flywheels with a **different diameter**.

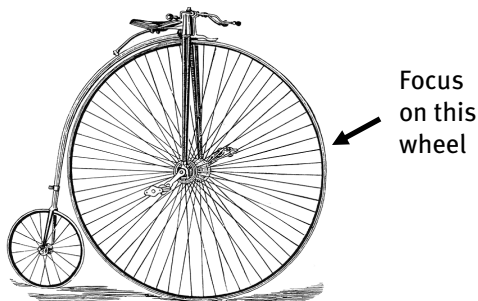
Record the mass of each wheel, and the material each is made of:

Flywheel #1 **answers will vary** Flywheel #2 **answers will vary**

Spin the wheels again with your friend. Which wheel spun longer this time? Circle your answer above. **Answers will vary depending on the wheel chosen, but generally, the wheel that is wider and heavier will spin longer. (It may be a close match if the contest is between a heavy flywheel with a small diameter and a light flywheel with a large diameter.)**

- c. Based on your research, consider the following:

Imagine you are riding one of these bicycles down a hill, travelling very fast. Which bicycle would be harder to stop? Circle your answer below:

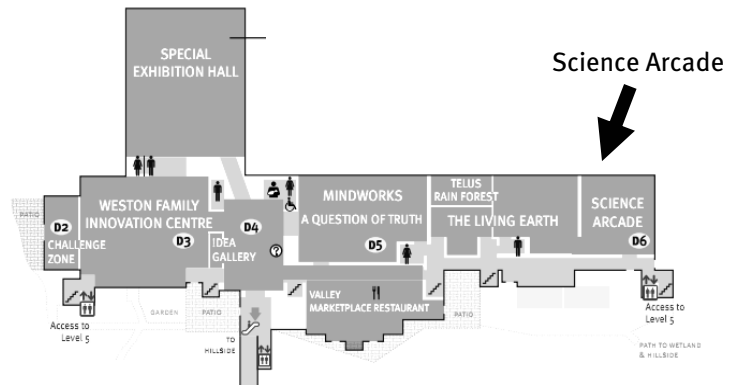


(Steel frame)

This bicycle has a heavier frame and the wheel connected to the pedals has a larger diameter.



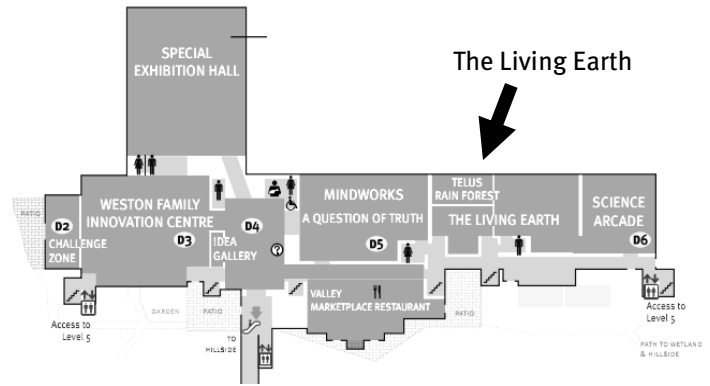
(Aluminum frame)



THE LIVING EARTH: Level 6

B. INTERACTIONS IN THE ENVIRONMENT

- Trek through the **Rainforest** and observe the different plants and animals in this ecosystem. Describe the abiotic (non-living) components of the rainforest. How is it different from a local forest?

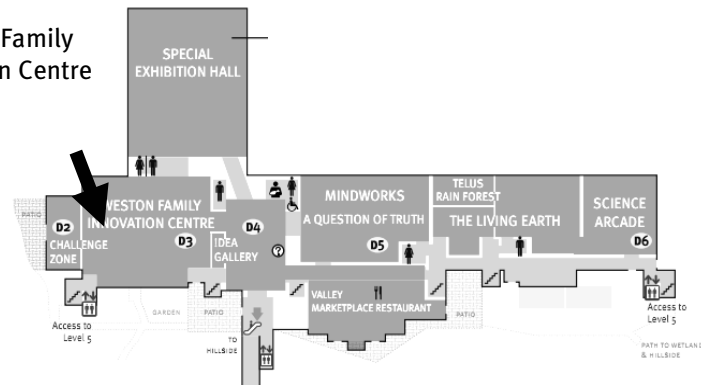


	Maple-Beech forest (Southern Ontario)	Rainforest (Costa Rica)	Cave (Southern Ontario)
Temperature	Winter – cold Summer – warm	Warm all year	Cool in summer, cold in winter.
Humidity	Moderate	High	Moderate
Level of sunlight	Winter, spring – high Summer, fall – moderate	Level of sunlight is high all year but heavy canopy prevents it from reaching understory.	Little or no sunlight at all.
Soil type (Hint: Do the trees lose their leaves?)	Forest floor covered in leaf litter (thick, rich soil)	Soil is thin and low in nutrients. Very few or no leaves on ground.	No soil visible in OSC cave, though in real life the cave floor may be covered in bat droppings and/or detritus that washes in from outside.

- Spend a few moments exploring the cave. Compare the abiotic elements of the cave to the rainforest, and note your observations in the chart.

WESTON FAMILY INNOVATION CENTRE: Level 6

Weston Family
Innovation Centre



C. PURE SUBSTANCES AND MIXTURES

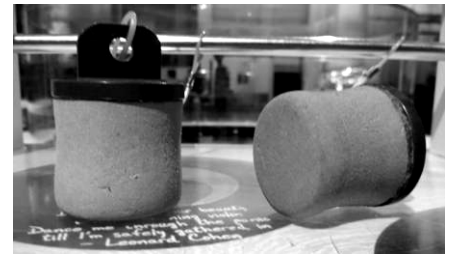
5. Find the **Ferrofluid Piano**, and spend a few moments testing it out. If you have an mp3 player, try plugging it in!

The black liquid you see is a *mixture* of a solid and a liquid. The tests on the next page will help you to find out more about how the piano works.

- a. To the right of the piano keyboard, you'll find a tube of oil with some goo at the bottom, as below:



Find these objects.



- b. What happens when you bring the two grey objects together?
They repel one another.

- c. What do you think they are?
The objects are magnets.

- d. Place one of the grey objects against the rust-coloured goo at the bottom of the tube. What happens?
The goo will gather around area where the magnet is applied. It will also align itself with the magnetic field, similar to the picture on the right.



- e. What do you think the rust-coloured goo is made of?
It contains iron particles.

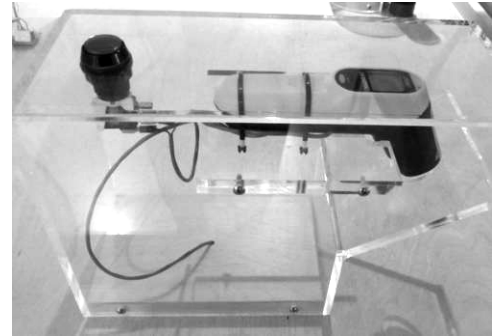
- f. Use the information from your experiments to make a guess about how the piano works.

The ferrofluid contains iron particles suspended in a liquid. When the piano plays, electromagnets underneath the ferrofluid are switched on, causing the fluid to stand up (it is aligning itself w/ the magnetic field).

D. HEAT IN THE ENVIRONMENT

6. Find the **Infrared Thermometer**.

To take the temperature of an object, place the object underneath the thermometer, and press and release the button.



- a. Take the temperature of your hand, then a friend's hand.
Record your results below:

Your hand temperature: **Answers will vary, but should be lower than the normal core temperature of 37°C.**

Your friend's hand temperature: **same as above.**

- b. Rub your hands together for 20 seconds, and then take their temperature again:
Answers will vary.

- c. Take a piece of *paper* and place it over your hand.

Take your temperature again, through the paper. Record it here: **Answers will vary.**

- d. Repeat the experiment again, with a piece of *fabric*.

Record your result here: **Answers will vary.**

- e. Circle the material that you think is a better *insulator*.
(Hint: Which material did a better job of blocking the heat from your hand?)

Paper

Fabric **Answers will vary.**

- f. What helped you decide?

The answer should be the material that produced the lower temperature measurement when used as an insulator in question c & d.

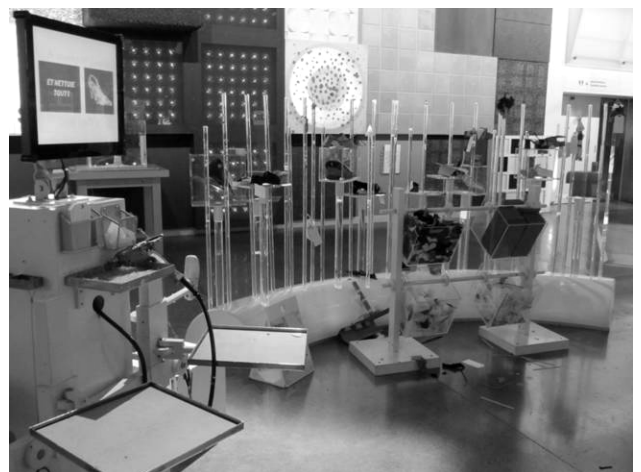
7. Find the **shoe-making area**.

- a. Spend no more than 10 minutes making a mitten to *insulate* your hand. If you have a camera, take a picture of it when you're finished.

- b. When you're finished, go back to the **infrared thermometer** and test it against a friend's creation.

Whose mitten was a better insulator?

Answers will vary.



- c. How did you know? **Again, the better insulator will be the mitten that produces the lower temperature reading when tested with the infrared thermometer.**

FOLLOW UP (to do after your trip)

SPACE

Research the Space Shuttle *Columbia* disaster.

- a. What caused the accident?
- b. Do you think anything could have been done to prevent it?

WESTON FAMILY INNOVATION CENTRE

- a. What is the 15 Below jacket?
- b. What is the advantage of this jacket, when compared to a regular winter coat?
- c. What material provides the insulation?

THE LIVING EARTH

Scientists observe that human-caused climate change is already altering Canadian ecosystems.

- a. Can you find an example of a species that will benefit from climate change?
- b. How might this affect the ecosystem in which this species lives?