Teacher's Guide: Space Centre Scavenger Hunt

Audience: high school students
Objectives: To explore and observe various aspects of space and astronomy in a fun and engaging way.

Curricular competencies:

- Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest.
- Make observations aimed at identifying their own questions, including increasingly complex ones, about the natural world.
- Connect scientific explorations to careers in science.

Preparation:

- Before starting the scavenger hunt, divide students into groups of 3 – 4. This will provide an opportunity for students to work collaboratively with their peers.
- To ensure students stay on task, give a time limit of approximately 30 minutes. Some groups may not be able to complete all the questions (complete in class at another time).
    - Assign each group to start at a different section. This will help limit crowding at some of the stations. Once completed, they can move on to the next section. This activity does not need to be completed in chronological order.

Classroom follow-up:

- In class ask the students to share their findings, observations, and ideas. Refer to the answer key for sample answers. There are a few links to good web resources included in the answer key.
- Debrief questions you could ask:
    - "What did you like most about this activity?"
    - "What is one interesting thing you learned?"
    - "Would you want to go to space?"

Group members: _____

Space Centre Scavenger Hunt

Welcome to the Cosmic Courtyard at H.R. MacMillan Space Centre! Your mission is to find and complete the following questions. Have fun!

Spacesuits

An **EVA** (Extra-Vehicular Activity) **spacesuit** is used for planetary explorations or spacewalks. What do you think spacesuits protect astronauts from when spacewalking?

Find the spacesuit and take a picture in it. Find out more about spacesuits:

Astronauts still need to use the washroom in space. Do astronauts pee in their spacesuits? What do they do with their urine?

The Moon and moons

Can you find some **footprints on the Moon**? When astronauts walk on the Moon's surface, they leave footprints that will last for millions of years. Why do you think they would last that long? Share your thoughts with someone.

Which **moons** in our solar system have liquid on them?

Find the **Moon probe** and the information nearby. What 2 Canadian innovations went to the Moon?

Find the big **meteorite**. How heavy is it? _____ kilograms. (This is as heavy as a small dog!) Now, look at the picture of the colourful Moon behind it. How are the craters formed?

What does the size of the craters tell you about its formation?

Meteorites

Find the **6 small meteorites.** Notice the different shapes, sizes, and textures. What are meteorites mostly composed of?

Find the **cross-section showing layers** of earth. Can you see a layer that is slightly lighter in colour? This layer is linked to the asteroid responsible for the demise of the dinosaurs. What is this layer called?

ISS

Find the **ISS (International Space Station) cabin**. Stand on the disk and press the buttons. Stare at the dots for 20 seconds. How do you feel? Share your thoughts with someone.

Find a **model of the ISS**. (Hint: look up!) Notice the wing-like structures. Are wings necessary for space travel? What purpose do they serve?

Find the model of the **Canadarm2** with **Dextre** attached (near the Groundstation Canada Theatre). They both hold objects, but they do it in different ways. Can you explain how they each work? Why do they need to hold objects?

Find out more about Dextre, the Canadian space robot:

Mars

Find **Sojourner** (small rover on Mars). Why do we need to send a rover to Mars? Compare the model of Sojourner and to the picture of the rover Curiosity (the image of the rover on the wall). What are the biggest differences and similarities between Sojourner and Curiosity?

Did you know that Sojourner was the first to break the Internet? Find out more:

Exploring Space

Find the **cloud chamber** that detects **cosmic rays**. The cloud chamber detects 3 different particles. Observe the chamber for 30 seconds and write down which particle you saw the most.

Where do these particles originate from?

Count the total number of models of each of the following in the courtyard. Don't forget to look up!

Rockets: _____
Space shuttles: _____
Artificial satellites: _____

What are the differences between each of them? What do you think they each do?

Scavenger Hunt Answer Key

Spacesuits

An **EVA** (Extra-Vehicular Activity) **spacesuit** is used for planetary explorations or spacewalks. What do you think spacesuits protect astronauts from when spacewalking? Find the spacesuit and take a picture in it.

> *Spacesuits are worn to protect astronauts from radiation, dust, debris, and extreme temperatures. It also provides oxygen and monitors their vitals.*

Astronauts still need to use the washroom in space. Do astronauts pee in their spacesuits? What do they do with their urine?

> *Urine is collected in a large yellow bladder bag. Urine is then deposited into space, and a small portion is freeze-dried to bring back to Earth and test how astronauts' bodies respond to life in space.*

The Moon and moons

Can you find some **footprints on the Moon**? When astronauts walk on the Moon's surface, they leave footprints that will last for millions of years. Why do you think they would last that long? Share your thoughts with someone.

> *There is no weather on the Moon, so footprints won't disappear!*

Which **moons** in our solar system have liquid on them?

> *Europa and Enceladus have liquid water oceans; Titan has liquid methane oceans. Scientists are making new discoveries about the moons in our solar system all the time. Discover more about water in our solar system with NASA's Ocean Worlds.*

Find the **Moon probe** and the information nearby. Find 2 Canadian contributions to early Moon exploration.

> *Canadian geologist Dr. David W. Strangway developed an experiment to study lunar soil. The legs of the Lunar Module Eagle were built in Montreal.*

Find the big **meteorite**. How heavy is it? *13* kilograms. (This is as heavy as a small dog!) Now, look at the picture of the colourful Moon behind it. How are the craters formed?

> *Due to meteorite impacts.*

What does the size of the craters tell you about its formation?

How big the meteorites were and how fast they were moving.

Meteorites

Find the **6 small meteorites.** Notice the different shapes, sizes, and textures. What are meteorites mostly composed of?

Iron and nickel

Find the **cross-section showing layers of Earth**. Can you see a layer that is slightly lighter in colour? What is this layer called?

Iridium

This layer is linked to the asteroid responsible for the demise of the dinosaurs.

ISS

Find the **ISS (International Space Station) cabin**. Stand on the disk and press the buttons. Stare at the dots for 20 seconds. How do you feel? Share your thoughts with someone.

Dizzy, nauseous, disoriented, weird, etc.

Find a **model of the ISS**. (Hint: look up!) Notice the wing-like structures. Are wings necessary for space travel? What purpose do they serve?

The wing-like structures are solar panels that are used for energy to be used in the space station.

Find the model of the **Canadarm2** with **Dextre** attached. (Near Groundstation Canada Theatre) They both hold objects, but they do it in different ways. Can you explain how they each work? Why do they need to hold objects?

Dextre's multi-jointed arms with its human-like sense of touch delicately grips equipment. Canadarm2's hand (called a latching end effector) uses 3 cables to tighten around an object and hold it in place. They are used to move equipment, supplies, and astronauts.

Group members: _____

Mars

Find the **Sojourner** (small rover on Mars). Why do we need to send a rover to Mars? Notice the differences between the Sojourner and Curiosity (the image of the rover on the wall). What do you think was the purpose of the Sojourner mission compared to the Curiosity mission?

> *The rover was sent to take pictures and explore Mars.*
> *Sojourner has solar panels for energy.*
> *Curiosity has a different power source (radioisotope power system) and it's a lot more complex than Sojourner (more instruments, arms).*

Exploring Space

Find the **cloud chamber** that detects **cosmic rays**. The cloud chamber detects 3 different particles. Observe the chamber for 30 seconds and write down which particle you saw the most.

> *A lot of muons and electrons.*

Where do these particles originate from?

> *Alpha particles come from radon, a naturally occurring element in the air. Muons form when cosmic rays collide with molecules in the upper atmosphere. Some electrons are also from cosmic rays. Cosmic rays originate in space from events like supernova. Find out more about the discovery of cosmic rays with CERNs cosmic ray timeline.*

Count the total number of each of the following in the courtyard. Don't forget to look up!

- **Rockets**: *4*
- **Space shuttles**: *4 (2 are in a glass case)*
- **Artificial Satellites**: *7 (5 hanging from ceiling, 2 in glass cases)*

What are the differences between each of them? What do you think they each do?

Web Resources

NASA's Ocean Worlds - https://www.nasa.gov/specials/ocean-worlds/
Apollo lunar 'soil' study - *https://www.lpi.usra.edu/lunar/missions/apollo/apollo_17/experiments/sep/*
Cloud chamber - https://timeline.web.cern.ch/charles-thomson-rees-wilson-sees-particle-tracks
CERN cosmic ray timeline - https://timeline.web.cern.ch/timeline-header/146
Space Centre online resources - https://www.spacecentre.ca/online-resources