



## FAMILY GUIDE OF ACTIVITIES & THINGS TO DO

Are you and your family ready for the risks and rewards involved in *Facing Mars*?

The purpose of this Guide is to accompany *Facing Mars*, an interactive, hands-on exhibition about preparing for a voyage to the Red Planet. In this exhibition, you and your children can make discoveries and decisions that may influence your thoughts and opinions on a journey to Mars.

How would you cope with a dust storm on Mars? What would you do to keep your solar arrays free from dust for maximum power? Blast off into space! Design and launch your own rocket and test your ideas on what is necessary for a successful liftoff! Examine a Martian meteorite and find out what clues and questions this interstellar traveler provides. Can astronauts deal with the confinement and boredom of a three year journey to Mars? Would they risk their lives for a chance to explore space? Should humans even be going into space? Would you go?

### This guide contains the following:

- A brief overview for each experience
- Hands-on investigations and other family fun.
- Cool websites for Kids and Parents
- Movies/Videos
- Books for Kids and Parents

### When you visit Facing Mars:

- Share the adventure with family members
- Try some of the suggested activities before and after your visit for further exploration

*Facing Mars is produced and presented by the Ontario Science Centre*

## WHAT IS THIS EXHIBITION ALL ABOUT?

### Are Humans Ready?

Would you leave behind your family, friends and home to risk your life on a three-year, round-trip voyage to Mars? In FACING MARS, you have the chance to answer this question twice: as you enter the exhibition and again as you exit.

Should we even go to Mars? Are we ready? Will humans go to Mars for scientific or financial gain? You can actively explore some of the trickier questions about life – and death – in space.

### Surviving in Space

Space is not a friendly environment for human beings. Find out how microgravity weakens your bones and muscles, and even challenges your heart. Experiment with techniques that could counter these effects. See first-hand how being in space would affect your face and your stomach.

Dealing with the dangers of intense space radiation is a major challenge in venturing outside of Earth's protective atmosphere. Experiment with shield materials and check current conditions on the Sun. What would you eat on a three-year mission to Mars?

### Getting Emotional

Perhaps some of the biggest challenges of journeying to Mars are the emotional and psychological ones – we do not know how isolated and cramped quarters will affect a crew once Earth is just another speck in space.

Explore your own sense of personal space, tolerance for boredom and lack of stimulation. How well would you cope with a crew under stressful conditions?

### Looking for Life

Are we alone? Could Mars harbour alien life? How would we recognize Martian life if it differed vastly from ours? Explore some of the reasons why some scientists think that Mars may have once sheltered life, how we might look for it and how we can attempt to understand the Martian environment by studying extreme life forms on Earth.

### Going to Mars – and Getting Back

Spending months in a confined space is not an ideal road trip. Efficient and innovative rocket and spacecraft design is critical for a mission – the better and more fuel-efficient the design, the more cargo the craft can carry.

Experiment with simple rocket designs. Test and launch your rocket to see how it performs. Space is a hazardous environment. See how resourceful you are in a crisis situation.

### Living on Mars

To survive on Mars, astronauts will be challenged in ways we can only begin to imagine. In such a cold and hostile environment, astronauts would have to depend on robots and gliders to go where human explorers cannot. Using tools while encased in a spacesuit is difficult, but working while surrounded by static-charged dust really intensifies the challenges.

Astronauts living on Mars would have to make use of local resources. They could mine ice as a source of water, air and fuel for the return trip. Explore some of these harsh challenges of life on Mars, as well as the more mundane, such as: what to eat and what to do with waste?

## LIST OF THE EXHIBITS IN FACING MARS

### **What does space do to your face?**

Explore some of the visible effects of microgravity on the human body – first-hand!

### **Can you give birth in space?**

Hear answers to some of the more awkward questions about life in space and on Mars and submit your own questions.

### **Spacecraft to Mission Control: do you copy?**

Explore the some of the real challenges of long-distance communication and how stressful that may be. Learn why no one might hear you scream in space.

### **Do you have the sense and sensibility for space travel?**

See how emotionally contagious you are – do you easily catch emotions from others, do you infect others with yours, or are you immune to other people's feelings?

### **How close is too close?**

Where do you draw the line between personal space and 'in your face'? Experiment with getting up close and personal then imagine how you'd deal with three years of it!

### **Are we there yet?**

Isolation – monotony – boredom. How will it feel to be away for months and years from all you have ever known? Enter the confinement chamber and begin to find out.

### **Choose a Mars crew with the right stuff**

Who should go to Mars? What combination of skills, gender and ages should make up the crew? Come up with the best team to head for Mars.

### **Gimme shelter**

Space is a harsh environment. Explore the dangers of space radiation and how engineers propose to shield astronauts from hazardous conditions as they hurtle through space.

### **Blast off!**

Design, test and launch your own rocket. Find out what makes for a stable flight, and what happens when your rocket is out of balance.

### **Can you cope in a crisis?**

Can you repair the broken solar panel so it can harness as much power as possible from the 'Sun'? Are you able to improvise to survive?

### **Life on Mars?**

Explore the possibility of life on Mars – how scientists are looking for it, and what extreme life on Earth can tell us about seeking life Mars.

### **Windows to Mars**

Understanding Mars begins here on Earth. Visit analogue sites where scientists conduct experiments, practise techniques and develop technologies for Mars.

### **Earth or Mars?**

Can you spot the differences between the third and fourth planets from the Sun?

### **Would you go?**

Tell the world if you would take the journey to Mars and after seeing the exhibition, tell the world again. Did you change your mind?

# FACING MARS



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### **A devil of a dust storm**

Mars is a global desert of dust and rocks, including massive, whirling dust devils. This simulated dust devil gives you a glimpse of what astronauts may have to weather on Mars.

### **Rock of ages**

Martians have been landing on Earth for years – Martian meteorites. Get a close-up view of a meteorite that was blasted off the surface of Mars millennia ago.

### **A bird's-eye view of Mars**

Explore Mars by air as you soar over terrain captured and modelled by orbiting satellites. See how the Martian land lies through some of the highest resolution images available.

### **Can you do the Marswalk?**

What might it be like to walk and move under Martian gravity? Using a harness and counterweight system, you can walk like an astronaut on the Red Planet. Discover how it feels to drop 62 percent of your weight in 30 seconds!

### **Fan a Martian dust storm**

Sticky, static dust coats everything on Mars. Explore how big a challenge these tiny particles pose by stirring up and stepping inside your own mini dust storm.

### **First, do no harm**

How do you cope with a medical emergency 50 million kilometres from home? Practice! See if you have the space surgery skills for Mars.

### **How hungry are you to go to Mars?**

Explore what astronauts will eat, what they might grow and how they will cope as they journey far beyond the delivery zone for takeout pizza.

### **Whirl 'til you hurl?**

Most astronauts experience space sickness in microgravity. How does being dizzy affect you? Can you still solve simple puzzles after 30 seconds in the spinning chair?

### **Good vibes**

Experience one of the ideas that scientists think may help counter bone density loss. Bone and muscle deterioration is perhaps the biggest obstacle to long-duration space flights.

### **Mars 101**

Visit our resource stations for answers to some frequently-asked questions and other riveting facts about exploring the Red Planet. Find out everything you were afraid to ask about waste in space.

### **Can you handle the pressure?**

How well can you work when there is little air? Experiment with simple tasks under low air pressure and find out why a good glove design is hard to grasp.

### **Winging it on Mars**

Experiment with how well gliders might fly on Mars and see if soaring over the Red Planet is as easy as it looks in the movies.

### **Baffle the bot**

Create a challenging Martian maze. Can the robotic rover navigate its way home?

### **Bring Mars to life**

Imagine it. Stage it. Shoot it. Create a stop-motion animation of pioneer life in a Martian colony.

### **Should we go?**

Explore some of the ethical questions and issues around a venture to Mars. Where do you stand?

## HANDS-ON INVESTIGATIONS TO DO WITH THE FAMILY

### A BIRD'S-EYE VIEW OF MARS

#### What it's about:

Landing an enormous spacecraft is no easy feat, but astronauts will have more than the mechanics to consider; they will also have to choose a landing site that meets multiple criteria. The atmosphere is thin, yet turbulence and high winds can make landings complicated. By reviewing images and videos from previous rovers and satellites, astronauts can get information about subsurface ice, craters and landslide sensitive areas. They can rely on technology for some of the information, but human expertise is also critical.

This experience allows visitors to flyover the surface of Mars to get up close and personal with some of the features of the Red Planet.

#### What to ask your children at the exhibit:

- Where would you like to land?
- What will you consider when choosing a landing site (*flat surface, near potential water source, shelter from dust storms etc.*)
- Can you spot some areas that you would avoid? Why? (*near edge of a crater or an extinct volcano*)
- What are some resources on Mars that astronauts could use? (*subsurface ice could be melted for drinking*)
- Is there anything else that you could use to your advantage on Mars?

## Make a Volcano

The focus of this activity is to gain a closer understanding of one of the prominent features on rocky planetary bodies such as Mars.

Baking soda, vinegar, and play dough can be used to model a fluid lava flow and learn how to spot a sequence of multiple eruptions of a martian shield volcano.

#### YOU WILL NEED

##### Play Dough (non-cooking recipe)

2 cups flour  
2 cup salt  
6 teaspoons alum or cream of tartar  
2 tablespoons oil  
1 cup cold water  
food colouring (approximately 20 drops)

small paper cups (3 or 4) or large ones cut down to about 1" (2.5cm) in height  
spoon  
tape  
baking soda  
vinegar  
cardboard or other surface (about 18" square)  
paper towels

#### WHAT TO DO

Go to: <http://is.gd/pq9>  
Lesson Three Lava Layering

## BLAST OFF! ROCKET LAUNCHING

### What it's about:

Rockets used during the Moon missions separated in stages, so as fuel was used up, the empty stages would fall away, leaving a smaller, more maneuverable spacecraft. Rockets used for the Space Shuttle don't need as much fuel and power because they do not go as far into space. Rockets need a lot of power to get them off the ground; the bigger and heavier the rocket, the greater the force that is needed to lift them. The rocket shape and design, the materials, and the fuel all contribute to the success of a rocket. What kind of rocket will we need to go to Mars?

### What to ask your children at the exhibit:

- What qualities do you want in a rocket design? (*stable, strong, reusable pieces*)
- What materials/shapes would provide those chosen qualities?
- What happened when you tested your rocket? What worked well? What do you need to improve? What could you try differently next time? (*if the rocket design is not successful, pick one thing to change for their next attempt*)
- Can your rocket withstand strong winds at liftoff? (*test with Wind Tunnel*)

## Make a Rocket

The focus of this activity is to make a rocket to illustrate how air pressure works to propel a rocket along.

### YOU WILL NEED

Long piece of string  
Large straw  
Two chairs  
Long balloon  
Tape

### WHAT TO DO

1. Thread the string through the straw. Stretching the string tight, tie both ends of the string to the tops of the chairs.
  2. Blow up the balloon and pinch it closed with your fingers so the air won't escape.
  3. Tape the balloon to the straw. Works best if you secure it at both ends of the straw.
  4. Slide the balloon and the straw to one end of the string so that the front of the balloon is facing towards the opposite chair.
  5. To launch the rocket, simply un-pinch your fingers.
- Try making several rockets with different shape balloons. Do they fly the same way?
  - Blow them up to different sizes. Do they fly as far along the string?
  - Tie one end of the string higher than the other. Does the balloon have enough thrust to travel up the string?

## CAN YOU HANDLE THE PRESSURE?

### What it's about

Gloves and spacesuits need to protect astronauts from the extreme heat, cold and pressure of space. The gloves need to allow astronauts to complete experiments that require lots of fancy finger work! These jobs are made more difficult and dangerous due to the low air pressure in space and on Mars. The lower pressure outside the glove causes the air inside the glove to expand as it tries to equalize. This effect can make the gloves puffy, awkward and uncomfortable.

### What to ask your children at the exhibit:

- How easy do you find the tasks once the gloves have been put on?
- How does that change once you extract some air, and the pressure is lower?
- How would you improve the space gloves?
- Which glove properties are the most important for space? (comfort, warmth, waterproof)
- Think of the gloves that you wear for different events. Which ones have properties that are important for space?

## Glove Testing

The focus of this activity is to see how a simple task can become a large challenge in space.

It should help you to feel what it is like to have an astronaut's gloves on and how hard it must be to work in space.

### YOU WILL NEED

Collection of nuts and bolts that fit together  
Dish gloves  
Gardening Gloves  
Ski Gloves

### WHAT TO DO

1. Using your bare hands, practice unscrewing and screwing a nut from a bolt.
2. Put the three set of gloves on both hands. Start with the dish gloves, then the gardening gloves and then the ski gloves.
3. Now using your gloved hands, unscrew the nut from the bolt. How easy or hard is the task now.



## SPINNING CHAIR or WHIRL 'TIL YOU HURL

### What it's about:

Feeling dizzy, disoriented, and nauseous? Welcome to space training! Some astronauts get motion sickness during launch, and this can last for a few days until they adjust to the weightlessness of space.

The neurovestibular system is a network of eyes, ears and brain that is hard at work to make sense of the microgravity and the random spins involved in space travel. When spinning, tiny hairs in the inner ear send messages to the brain to report the movement. The canals in your ear are positioned to detect different types of movement (pitch, roll, and yaw). These canals try to keep a person balanced and ready for anything...a difficult task when floating around in space!

### What to ask your children at the exhibit:

- How you felt when you were spinning? *(if they feel uncomfortable, they can stop at any time)*
- How did you feel after you had stopped spinning and tried to complete the task?
- What are some real life experiences that might remind you of some of the physical symptoms associated with a space mission? *(riding roller coasters, spinning on playground equipment, watching movies on large screen)*
- What other occupations besides astronauts would need to be familiar with motion sickness? *(pilots, gymnasts, figure skaters, divers)*

## Test your Disorientation

The focus of this activity is to show the importance of the inner ear in keeping your balance. It is a way to re-create the experience at home.

### YOU WILL NEED

Swivel chair  
Blindfold

### WHAT TO DO

1. Blindfold the chosen person or ask them to close their eyes.
2. Have them sit on a swivel chair and turn slowly around a few times. Remove the blindfold or tell the child to open his or her eyes quickly. Note that there is little loss of balance and little dizziness. The fluid in the inner ears' semicircular canals stabilizes quickly.
3. Repeat the experiment but have them spin faster and for a longer time. When the person opens his or her eyes the dizzy feeling will be stronger and the subject's balance will be more disturbed, as the fluid in the semicircular canals is taking longer to stabilize.
4. Repeat the second experiment with the head forward, chin on chest. His or her sense of balance will be even more uncertain since the head is in an abnormal position and the feelings of dizziness will be that much stronger.



## WHAT DOES SPACE DO TO YOUR FACE?

### What it's about:

In microgravity (en route to Mars), our blood does not circulate the same way as it does on Earth. In the microgravity of space, the fluid is not pulled down with the same force as with Earth's gravity and a fluid shift occurs. The legs become smaller as muscles force blood and other fluids toward the upper part of the body. The fluid redistributed in the chest and head can cause stuffy sinuses, headaches and even difficulty tasting! With microgravity, there is no "right side up", and this may cause difficulties in reading facial cues that we take for granted here on Earth

### What to ask your children at the exhibit:

- What does it feel like being tilted?
- What other systems would work differently in microgravity? (*loss of bone mass and muscle because bodies are not working against the force of gravity, increased blood pressure*)
- How would microgravity (free fall) affect your daily life and routines? (*no chips because crumbs would float everywhere and get into equipment, no showers because loose water droplets could damage equipment and grow mold!*)

## Make your own Puffy Face

The focus of this activity is to demonstrate what happens when there is a fluid shift to the upper part of your body.

### YOU WILL NEED

Camera  
Measuring tape  
Erasable marker  
Adjustable bench or any inclined plane

### WHAT TO DO

1. Have person lie flat on ground and take their picture with camera.
2. Next have person lie on the bench with the head about 30 cm lower than the feet and remain in this position for a few minutes.
3. Take picture of their face after those few minutes, trying to keep camera the same distance from their face.
4. Bring them back to the flat position and take another picture 5 or 10 minutes later.
5. Using those pictures, see what differences you can note. Are the veins more swollen, does the skin look smoother, is there a colour difference to the skin?
6. How long did it take to go back to its original look?

## HOW HUNGRY ARE YOU TO GO TO MARS?

What it's about:

What kind of foods would you take of a 1000 day camping trip? It is possible to grow your own food on Mars or grow it along the way? How do you cook in space? What will astronauts eat and how will they cope as they journey far beyond the delivery zone for takeout pizza.

If you were to be a chef on Mars, the challenge would be to come up with well-flavoured and nutritious food with only a small selection of ingredients. Could you come up with 10 different recipes if you were given only 9 basic ingredients?

Food is not only important to stay healthy and survive but could also be important psychologically for the crew also.

### What to ask your children at the exhibit:

- How would you feel if all the food you ate was brown?
- How would you like it if you had to eat the same food for an entire day, a week, a year, three years?
- What could be dangerous to an astronaut about a floating breadcrumb?
- Why would it be bad to eat runny soup in space?
- How would you like it if on your birthday your birthday cake was made out of spinach?
- How tasty does all that dried food look? What would happen if you ran out of water?

## Iron Chef on Mars

The focus of this activity is to come up a variety of different things to eat using a minimal number of ingredients. This is an important activity to do with an adult since it will most likely require the use of various kitchen utensils and appliances.

### YOU WILL NEED

Rice, onions, tomatoes, soy, potatoes, lettuce, spinach, wheat

### WHAT TO DO

1. Pick one or two of the ingredients from the list above.
2. Try to create at the main dish for each meal of the day out of a combination of one or two of the ingredients above. For instance have a day where breakfast is a potato crepe (wheat and potato), potato salad for lunch (potato, tomato, onion) and potato soup for dinner (potato, onion, tomatoes).
3. Eat those foods for just one entire day and see how you like it.
4. Remember you won't have a lot of other essentials such as oil, sugar, salt for flavouring so don't use those ingredients too much.
5. Take a few other ingredients and add a few other dishes keeping to the list. What if that is all you ate for the entire week? Try it!

## COOL WEBSITES FOR KIDS AND PARENTS

Mars Project  
[www.marsproject.com](http://www.marsproject.com)

Nasa Kids Club  
<http://www.nasa.gov/audience/forkids/kidsclub/flash/index.html>

Cool Cosmos  
<http://coolcosmos.ipac.caltech.edu/>

Canadian Space Agency  
<http://www.asc-csa.gc.ca/eng/>

## MOVIES/VIDEOS

### **Race to Mars**

2007 Canada (TV Mini-Series)

In the year 2030, the race to be the first to reach the Red Planet is on - and China is leading the way. Once again, America and its partners, including Canada, are thrust into a winner-take-all space race.

### **Transformers**

2007 USA - PG-13

Dueling alien races, the Autobots and the Decepticons, bring their battle to Earth, leaving the future of humankind hanging in the balance.

### **Tom and Jerry: Blast Off to Mars**

2005 USA - G

Tom and Jerry mistakenly stow away on the first manned mission to Mars and discover we are NOT alone ... Martians do exist!

### **Mission to Mars**

2000 USA - PG

Upon setting foot on the red planet, the first manned mission team discovers an ancient, dome like structure which appears to be a beacon but danger exists and they require a rescue mission from Earth..

### **Escape from Mars**

1999 USA/Canada - PG

Five astronauts make the first manned trip to Mars, in the second decade of the 21st century. The Red Planet has many surprises in store for them.

### **My Favorite Martian**

1999 USA - PG

The Martian Has Landed. News producer Tim O'Hara witnesses the crash of a small Martian spacecraft, realizing his one-time chance of delivering a story that will rock the earth.

### **Brave Little Toaster Goes To Mars**

1998 USA - G

Thomas M. Disch's underwhelming sequel, based on the book sequel, has our heroes zooming off to, of all places, Mars.

### **Mission to Mars**

1997 USA

Educational video hosted by Charlie Sheen revealing, "Is there life on Mars?"

### **Rocketman**

1997 USA - PG

Fred Z. Randall is a spacecraft designer, who gets the chance to make his dream come true and travel to Mars as a member of the first manned flight there.

### **Mars Attacks!**

1996 USA - PG-13

The Martians decide to attack our planet and devastate everything. Will somebody find a way to stop them or will everyone die in the war with these short, big-brained aliens?

### **Space Jam**

1996 USA - PG

Swackhammer, owner of the amusement park planet Moron Mountain is desperate to get new attractions and he decides that the Looney Tune characters (including Marvin the Martian) would be perfect.

### **Capricorn One**

1978 USA/UK - PG

A group of astronauts are pulled off their ship just before launch and whisked off to a film studio in the desert. The space vehicle has a major defect which NASA dare not admit. At a studio, the astronauts are forced to act out the journey and the landing to trick the world into believing they have made the trip. Eventually they are left with no choice but to try and escape.

## BOOKS FOR KIDS AND PARENTS

Ward, David J. **Exploring Mars.**  
Lerner Publications Co., 2007.

Dunn, Mary R. **A look at Mars.** PowerKids Press, 2008  
*The mysteries and wonders of Mars are introduced in this title. Particular attention is paid to the most recent scientific discoveries.*

Graham, Ian. **The near planets.** Smart Apple Media, 2008.

Jefferis, David. **Exploring Planet Mars.** Crabtree Publishing, 2007  
*Looks at the scientific facts about Earth's nearest neighbor and delves into future exploration of the planet--possibly even colonization!*

Jefferis, David. **Mars.** Crabtree Publishing, 2008

Kortenkamp, Steve. **Why isn't Pluto a planet? A book about planets.** Capstone Press, 2007  
*What is a planet anyway? How come Pluto isn't one? Are there any more planets? Scientists are learning more about these questions every day. Look inside to discover more about the mysteries of the planets in our solar system.*

Leedy, Loreen. **Messages from Mars.** Holiday House, 2006.  
*Written in e-mails from orbiting students to their earthbound friends and family, Photographs from NASA are combined with illustrations of the characters to put laughs together with solid information.*

San Souci, Daniel. **Space Station Mars.** Tricycle Press, 2005.  
*Danny and the rest of the clubhouse crew begin a quest to find flying saucers and make contact with Martians. Such top secret work can be tricky when the "Martians" come looking for a lost "meteor."*