2012 Mars Science Laboratory and Gale Crater Tactile Set

Nearly half way between the "Death Valley" (Hellas Basin) and "Mount Everest" (Olympus Mons) of Mars, the mysterious crater called Gale awaits further exploration by the rover Curiosity. Living up to its name's sake, the rover is exploring Gale Crater after landing on Mars in August, 2012.

This set of tactile images will assist you in your exploration of this wonderful world on your own. Let's start by exploring some of the planet's most prominent features.

TACTILE ONE: A FACE OF MARS

Tactile one depicts one side of the round orb that orbits the sun at about 228,000,000 km from our Sun. As you move your fingers around the planet, first explore the rim that runs around the planet that defines the visible horizon of the round orb seen in the sky. The actual planet would come out of the plane of the tactile like half of a soccer ball. The back side of the soccer ball is not visible unless it rotates into view.

Mars is similar to Earth in many ways; however, many of its features are much larger than similar features on Earth. As you continue to explore the surface of Mars, you will notice a long groove running left and right, just below the middle of the tactile. This canyon on Mars is called Valles Marineris but dwarfs the Grand Canyon. If found on earth, it would stretch from the east coast to the west coast of the United States.

On the far left side about 2 finger widths from the end of Mariner Valley, notice a small bump. This bump represents one of three large shield volcanoes. The other 2 volcanoes can be found above the first, each separated by about 2 finger widths. These are known as the Tharsis Montes. Further around the rim of Mars, or to the west of the top volcano and out of view, is Olympus Mons, the "Mount Everest" of Mars.

TACTILE TWO: MARS at 180°

This tactile reveals Mars at 180 degrees longitude. We have rotated Mars to the right about 120 degrees from the first tactile. Therefore the 3 Tharsis volcanoes that were found on the left side of tactile one are now on the right side of this one.

Starting in the lower right hand corner, find the label for the Tharsis Montes. Montes (singular Mons) is the Latin word for mountains. Follow the guide line to the bump representing the middle volcano which is part of the Tharsis region on Mars. Just below and to the left, and above and to the right are 2 other shield volcanoes. These volcanoes range in height from 18 km to 14 km! For comparison, the highest volcano on Earth is about 9 km and Mount Everest is only about 8 km (5 miles) high.

Now find the upper right hand label for Olympus Mons. Follow the guide line to the bump representing the volcano Olympus Mons. How does it compare to the 3 volcanoes just explored? Olympus Mons is the largest known volcano in our solar system and rises about 21 km (14 miles)!

Further west, or to the left, of Olympus Mons is Elysium Planitia which is home to 3 more volcanoes. They are labeled in the upper left hand corner of this tactile. Ranging in height from 14 to 5 km, they are smaller than those found in the Tharisis region. These volcanoes can be used as a guide to find Gale Crater. Using the 2 upper volcanoes, strike a straight line down through them until you reach a rough portion of Mars. Gale Crater is found just to the right, or east. In the center of Gale Crater, you will easily feel the peak of Mount Sharp that is found near the center of the crater.

TACTILE THREE: GALE CRATER

Tactile three shows two views of the crater Gale where Curiosity is exploring. The top view represents a bird's-eye view from high above the crater. It would be how the crater would appear if we were soaring high above the crater looking down on it.

The second view on the bottom of the page is a cross-section view of Gale. Imagine this… if you slice an apple into two pieces and then observe the peel, edible part, and core; that would be the equivalent of a cross-sectional view of an apple. That is the same idea of what the bottom tactile represents… the view of the crater from the side including what's above ground and what's below ground.

Feel the top bird's-eye view. Start from the left hand side and trace your finger around the rim of the crater. Sighted assistance may help you determine the rim of the crater. On the tactile, the rim is about 10 cm across. If each cm on the tactile is approximately 15 km on Mars, what is the diameter of Gale Crater? In the middle of the crater, notice the odd shaped mound which is very prominent in Gale.

Now explore the bottom tactile representing the cross-section. Starting on the far left, trace your finger along the surface of Mars and notice that your finger eventually falls

down onto the crater floor. Continue to trace your finger from left to right, and you will soon encounter a central mound, recently named Mount Sharp. After Mount Sharp, your finger will then fall back onto the crater floor and up the rim on the right side of the tactile, which then slopes off to the right. Go back to the central peak and explore it compared to the crater rim. Central peaks are not uncommon to craters as large as Gale, but what makes this one unique is that it is higher than the surrounding rim of the crater. Gale Crater has a central uplift area that is 5 km (3 miles) high! Central peaks form by the rebound of rocks that were highly compressed at ground zero of the impact. However, these peaks do not exceed the height of the crater rims. The following tactile illustrates how a central peak could end up being higher than the rim.

TACTILE FOUR: EVOLUTION OF CENTRAL PEAK

Tactile four consists of 3 idealized diagrams representing the geologic history of a central peak similar to the one in Gale. Starting with the top diagram, trace your finger from left to right across the crater and notice how the surface sinks to the floor of the crater and then up the right side to the surface again.

The second diagram represents the same crater that has been filled with various layers of sediments. Each horizontal "layer" represents many different periods of sedimentation over time.

The third diagram represents the same crater after a long period of erosion of the existing layers of sediments. Notice how the central uplift is indeed now higher than the surrounding crater rim. Notice also the gaps on the right and left side of the central uplift that show the absence of the eroded sediments.

It is likely that Gale Crater has experienced a similar history. Since Gale Crater is so old, compared to many of the other craters on Mars, it would have had time to experience this geologic evolution. If this is the case with

Gale Crater, the rover Curiosity will be perfectly situated to explore the geologic history of the region through the exposed layers.

For more detailed tactile information on cratering and crater types, please see

"Getting a Feel for Lunar Craters" NP-2011-05-733-HQ

TACTILE FIVE: CURIOSITY

Tactile five depicts a side view of the rover whose name is Curiosity. Curiosity is the largest rover ever sent to explore another planet. The small car-sized rover has many instruments on board to help scientists study Gale Crater. Starting in the lower right hand corner, find the word “wheel” and follow the line to one of the wheels of Curiosity. Two other wheels are found to the right of the labeled wheel. Two more wheels can be found to the left of the labeled wheel. Curiosity has 6 wheels in all, of which only 5 can be detected on this tactile. Can you find 5 wheels? The other would be hidden from view by the body of the rover. The body of Curiosity and some of its accompanying instruments are found above those wheels and are labeled for your exploration.
For further exploration and information please see
http://www.nasa.gov/mars keyword, curiosity

Published July 2012, this book is intended for users of all ages with particular support to those who are blind and visually impaired. For an audio file and accessible PDF of the text; or to request a Braille copy of the text, go to www.hapticallyspeaking.com
Support for this book comes from NASA.