

Forces of Nature Immersion Theater

Experience simulations of extreme energy like earthquakes, hurricanes, and wildfires! Please be aware that this exhibit uses loud sounds, a moving floor, and indoor rain! There is a show every 15 minutes (on most days).

Supported by a grant from the Freeport-McMoRan Copper and Gold Foundation.

Make sure you see our additional exciting graphics:

- Volcanic Eruptions
- Active Atmosphere
- Oceans Erode the Land
- Ocean in Motion
- The Carbon Exchange
- Erosion
- Decomposition
- Plates on the Move
- Magnified Rocks
- Wind Shapes Land
- Rivers Erode the Land
- Water Goes 'Round



Forces of Nature

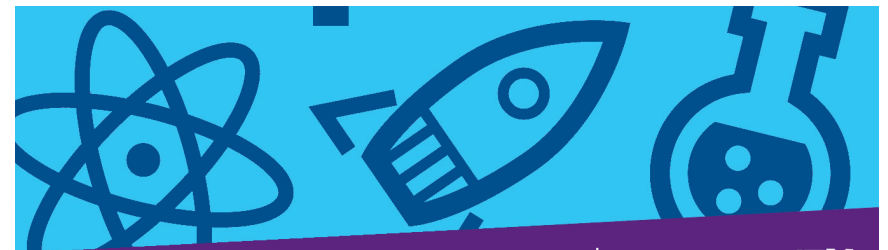
In the Sybil B. Harrington Galleries

The Earth is constantly changing. What forces shape Planet Earth?

CONSERVATION AND RECYCLING

The energy that shapes our planet comes from both the Sun and deep within the Earth. The energy is never destroyed—it is transferred to new physical processes. The energy from the Sun, for example, heats the Earth's air and water. The heated air and water in turn drive the water cycle and ocean currents. Energy from the Earth's core creates magma. Convection currents in the magma cause the movement of tectonic plates, resulting in huge releases of energy such as earthquakes and volcanoes and mild releases of energy such as geysers and hot springs.

The matter that comprises all of Earth's features is never lost—it is continuously being recycled. The Earth's crust is pushed up into mountains as a result of tectonic plate movement; at the same time, the mountains are being eroded by physical, chemical and atmospheric forces. The eroded rubble is then recycled into new formations.



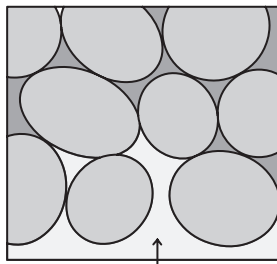
THE MAGIC PLANET

At the *Magic Planet*, you will learn about the following forces that move land, air and water on Planet Earth:

- Current Weather
- Earthquake Zones
- Pangaea
- Ocean and Air Currents
- Axial Tilt
- Tectonic Plates
- World Topography
- Volcanoes
- Oceans Draining
- Hurricanes and Tsunamis
- And much more!

Facilitators are available to answer your questions, and demonstrations are scheduled periodically throughout the day.

Air-Saturated Sediment

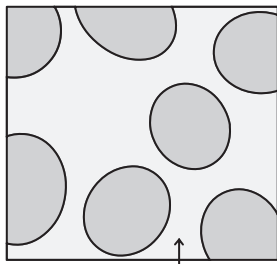


Air fills in the small space between grains. Friction between the grain holds sediment together.

TECTONIC BASIN: SHAKE IT UP!

The *Tectonic Basin* demonstrates liquefaction. Liquefaction happens when vibration reduces friction between particles of sediment and allows them to slide past each other and flow like a liquid. This is similar to the movement of sediment during an earthquake. Look carefully at the tops and edges of the sand dunes to see how much the sand and pebbles move.

Liquefaction



Air completely surrounds all grains and eliminates all **Grain-to-Grain Contact**. Sediment flows like a fluid.

EARTH ROCKS: TAKE A CLOSER LOOK

Rocks are classified as igneous, sedimentary or metamorphic. Here you can see and touch examples of each type of rock. Hold the magnifier very still on the surface of the rock for the best image and rotate the magnifier if the image is blurry. Some rocks have crystalline shapes, layers, or holes formed from escaping gas. Can you tell how each rock was formed?

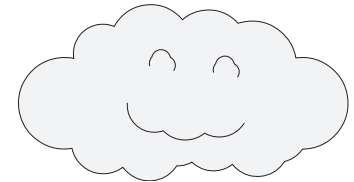
ROCK RECYCLER

The *Rock Recycler* demonstrates matter conservation as you virtually change sedimentary rock into igneous rock...and then into metamorphic rock...and then back into sedimentary! The material is never destroyed; it is only changed and recycled. You can see real examples of each rock type when you visit *Earth Rocks*.

CLOUD SPIN BROWSER

Water is captured in the atmosphere in the form of clouds that take different forms depending on altitude, temperature and air pressure systems. The *Cloud Spin Browser* projects images of 10 different cloud types on the wall, with their names and altitudes. Spin the controller forward and backward to watch how convection causes the clouds to form and move. Try to name the clouds you see when you get home!

Sponsored by U.S. Airways.



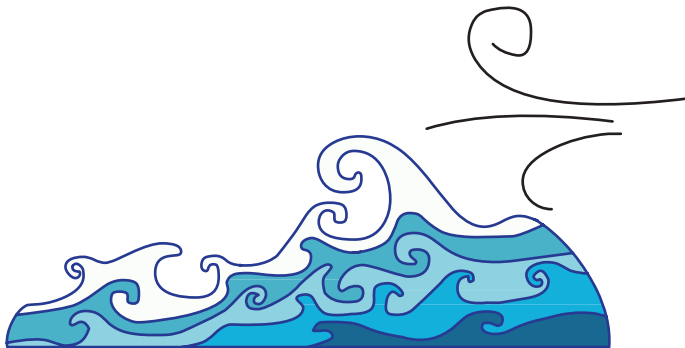
MEET THE SCIENTISTS

The biographies of three important scientists are featured in kiosks throughout the gallery. You will see pictures of them at work in different locations and the kinds of equipment they use in the field.

- Amanda Clarke, volcanologist
- Enrique Vivoni, hydrologist
- Yolande Serra, meteorologist

AEOLIAN LANDSCAPE: SCULPT WITH THE WIND

The *Aeolian Landscape* is an art piece that demonstrates the process of wind erosion in a sandy environment like a desert or beach. By changing the direction of air, you can slowly reshape the dunes, or you can just enjoy the beauty of the subtly shifting sand.



WAVE MAKER: CREATE WAVES WITH THE WIND

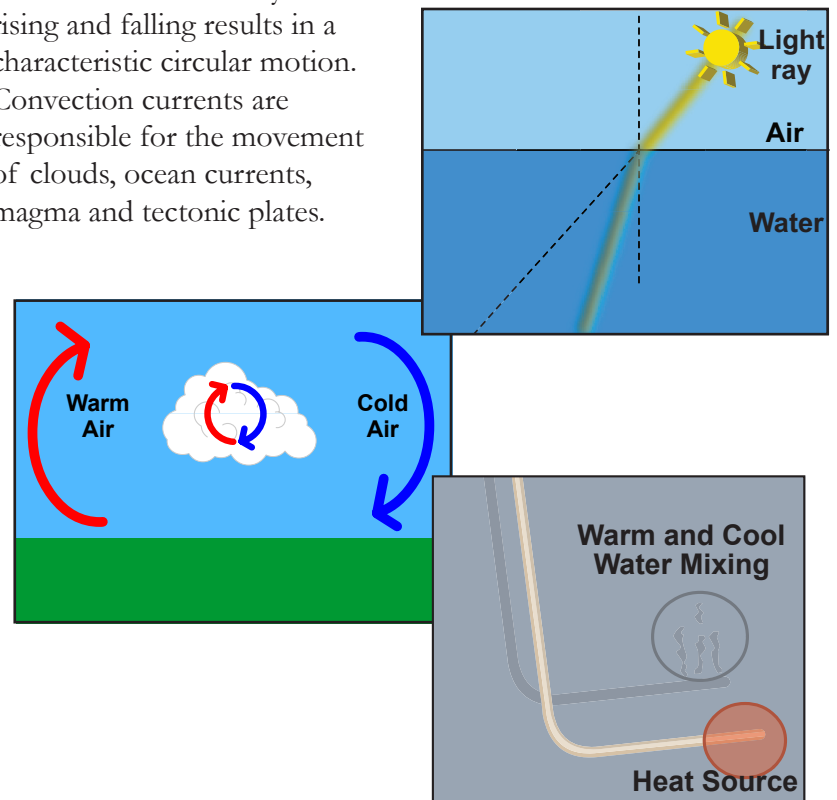
The *Wave Maker* demonstrates energy transfer. The water captures wind energy and turns it into movement in the surface layers of the water. When the fan is blowing softly, the surface of the water forms a gentle swell. When the fan is blowing hard enough, it produces one large wave that travels around the bowl.

CONVECTION CURRENTS: SEE THE HEAT

This exhibit demonstrates convection and refraction. Convection describes the movement of heated materials like water, air or magma. As these materials are heated, they expand, become less dense and rise.

As they move up and away from the heat source, they cool off and start to fall. This cycle of rising and falling results in a characteristic circular motion. Convection currents are responsible for the movement of clouds, ocean currents, magma and tectonic plates.

The tip of the metal arm heats the surrounding water, which rises with the circular motion of convection. You can see the shadows on the back of the tank because light bends (*refracts*) a little bit when it travels through water. Cool water is denser than heated water, and the density of the water affects the angle of refraction. The shadows show you where warm water and cool water are mixing.



RIFT ZONE

A rift zone is an area where magma rises up through the Earth. There are three kinds of rift zones on Earth: solitary volcanoes, fracture zones and ring dikes. The *Rift Zone* exhibit shoots jets of air through fine sand to mimic the different ways magma can erupt. Hold the button down to build up air pressure and then release it to see more powerful movement. How does the surrounding landscape respond to low and high pressured eruptions?

EXPLORE THE GRAND CANYON: AN INTERACTIVE TERRAIN EXHIBIT

Use the computer to learn about the physical characteristics and history of the Grand Canyon:

- Live Weather
- Temperature and Elevation
- Flood Lines
- Panoramic Views
- Historic Photographs
- Maps

STREAM TABLE: DIG IN!

The *Stream Table* demonstrates erosion. Physical erosion describes how solid materials such as rock, dirt and sediment are slowly worn or broken down and carried away by wind, water and ice.

First, shape the sand into dams, islands, forks and river banks and then see how your formations stand up to flowing water. The wet sand can block or divert the water and the water can shift the sand and rocks.

FOG RING: MAKE A VORTEX

A vortex is a mass of liquid or gas flowing in a circular motion around a center point. Tornadoes, whirlpools, dust devils and smoke rings are all examples of vortices (plural of vortex). Place your hands on the hand print locations and push down once - evenly, smoothly, firmly, and quickly - to produce a swirling, ring shaped fog vortex that flies up to the ceiling!

