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Science Storms' Six Iconic Exhibits

There are six large-scale, iconic exhibits within *Science Storms* that reveal the extraordinary science behind some of nature's most powerful phenomena: avalanches, tornados, tsunamis, sunlight, lightning and fire.

Through hands-on experimentation and state-of-the-art interactive media, these amazing and groundbreaking exhibit experiences help you investigate the physics and chemistry that makes nature's most awe-inspiring events happen. Below is a more detailed look at these new MSI icons—how they work, how you can interact with them, and how they were created.

AVALANCHE DISK

Avalanches demonstrate how forces such as friction and gravity can act on an object and affect motion. The avalanche disk illustrates how granular materials defy a normal definition of a solid state of matter because the material in the disk can behave like a liquid *and* a solid.

Trigger an avalanche by experimenting with a large, rotating disk of particles that show captivating patterns while in motion. The 20-foot-diameter disk is angled at a fixed incline and filled with a two-color granular mixture of glass beads and garnet sand. A motor rotates the disk, causing the mixture to shift and move. Granular materials like those in the disk can flow like a liquid or pack like a solid, behaviors that can be observed in nature.

Control the avalanche with a wheel that starts, stops, and alters the speed of the disk. Turn the wheel to the right and the disk speeds up in a clockwise direction. Hold the wheel in place to maintain the selected velocity, and turn the wheel to the left to slow the disk.

The rotation of the disk creates an ongoing series of controlled avalanches and patterns in the granular material as it flows, mixes, separates and stops.

On the Balcony, get a bird's-eye view of the avalanche disk and observe the disk's revolutions per minute. A camera lets you take video images of the disk's granular materials. The avalanche disk weighs 16,500 pounds and was fabricated by Production Resource Group in New Windsor, New York.

40-FOOT TORNADO

Tornados form due to a combination of physical conditions that can be isolated and studied. Immerse yourself in a 40-foot tornado to experiment with a towering vortex of vapor. Walk inside the swirling, illuminated tornado to disrupt its shape and then watch it reform. Control the flow along the height of the tornado enclosure and watch the vortex change, and turn on and adjust lasers to reveal turbulent air flow patterns.

The tornado is generated by an ultrasonic fog system beneath the raised exhibit floor. Forty-eight fog modules atomize a pool of water into a fog that rises through a grate. The vapor is drawn upward by a large exhaust fan mounted in the ceiling and into a dehumidifier that helps manage the Museum's humidity.

The tornado is contained by a pairs of curved walls that partially enclose the exhibit space and provide a background to better visualize the vortex. The floor-to-ceiling walls each contain a vertical duct system that uses dampers to direct air in a circular direction. The upper eight dampers on each wall can be opened and closed via controls on the main floor.

The tornado weighs 75,000 pounds. It was fabricated and installed by Production Resource Group of New Windsor, New York and Norcon, Inc. of Chicago.

WAVE TANK (TSUNAMI)

Energy can be moved from place to place, through space or materials such as water, in the form of a wave. Discover the power and motion of waves by unleashing your own tsunami across a 30-foot wave tank.

Control the wave tank by choosing the type of wave to create —tsunami or ocean waves—and setting the wavelength and height/amplitude. The tank is split in half and has two shorelines at the end, one shallow and the other steep. Observe the impact of the wave on the different coasts. Cameras record and play back images of the wave and force sensors show the wave's impact.

The tank is filled with 900 gallons of mineral oil, a material with similar viscosity to water, but one that will not evaporate. The wave tank was fabricated by Lexington Design and Fabrication of Los Angeles, Calif.

SUNLIGHT

Scientists have studied visible light for centuries, advancing our knowledge of its behaviors and properties and developing a variety of applications for light.

Explore the energy and colors in sunlight by experimenting with giant optical prisms that reflect natural light reflected through a 10-by-10-foot skylight by a heliostat mirror system on the Museum's roof. Recreate Newton's famous prism experiment by manipulating one of the four giant prisms to observe the physical nature of light. Turn a handle to move a mirror and capture the sunlight, directing it onto a prism that breaks up the white light into its component wavelengths. The result is a huge rainbow brilliantly reflected on 30-foot-tall white screens.

Learn about the energy in sunlight by converting it into heat and electricity. Focus sunlight through a large lens so that it shines on a liquid-filled tray. Moving the lens up and down increases or decreases the amount that the liquid is heated. A thermal imaging camera displays the physical changes in the liquid and shows beautiful, swirling convection patterns as the warmer liquid expands and rises and the cooler liquid contracts and shrinks.

Transform sunlight into electricity by changing the amount of sunlight falling on photovoltaic cells. The cells create electrical energy that is wired to a slot car track that encircles the exhibit. Use the energy to race two cars around the track. The more sunlight that falls on the photovoltaic cells, the more electricity is created and the faster the cars move.

When the weather is cloudy, the heliostat and lighting control system automatically trigger an artificial light source. The artificial light is deactivated automatically when the sun re-appears. The sunlight exhibit was fabricated by Chicago Scenic Studios.

TESLA COIL (LIGHTNING)

Lightning inspires scientists to study electricity and magnetism, leading to new knowledge and applications. Suspended from the ceiling high above the balcony, the Tesla coil creates a captivating indoor lightning storm. Experience the sight, sound and power of a high-voltage lightning strike as you learn about the connections between lightning, electricity and magnetism.

Based on the design of Nikola Tesla, the coil creates bright, loud and large electrical arcs. Two 20-foot-diameter grounding rings surround a round coil that sends high-voltage electrical arcs jumping 10 feet. The coil is grounded by six 10-foot grounding rods buried outside, just south of the Museum. These rods are connected to the coil by a 3 ½-inch copper pipe that runs from the exhibit, through the Museum and outside.

The Tesla coil discharges 1.5 million volts of electricity and can be seen throughout the exhibit. Take a seat in the reclined benches directly below the Tesla coil for the best view of the electrical storm and the accompanying video. Lightning flashes every 30 minutes and each discharge lasts up to 60 seconds. Museum staff are on hand to operate the Tesla coil throughout the day in interactive shows that explore the science behind lightning and how it's created inside the Museum.

The Tesla coil was fabricated by Advanced Entertainment Technologies of Monrovia, Calif.

LIVE-FIRE EXPERIMENT

Fire is a chemical reaction involving fuel, oxygen and heat. It responds to varying conditions, and these conditions can be manipulated and studied.

Study the chemistry of combustion by experimenting with live fire and witnessing how the flame reacts to changing conditions. Ignite and adjust a 12- to 18-inch flame inside a fireproof glass booth and manipulate the size of water droplets falling from an overhead sprinkler system to understand the interaction between fire and water.

A touch screen controls the entire interactive exhibit. Change the height of the flame by adjusting the flow of gas. Adjust the amount of water by varying the flow of water and the size of the water droplets. Turn on green lasers to illuminate the mist and see the fluid-like convection patterns, the circular air currents created when the hot flame and cool water interact.

The live-fire interactive is based on a test that Northbrook, Ill.-based Underwriters Laboratories uses to test sprinkler systems. This exhibit was fabricated by Advanced Entertainment Technologies in Monrovia, Calif.

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