MAD SCIENCE SPECIAL EVENT [SHOWS]
SCIENCE AND TECHNOLOGY CURRICULUM CORRELATIONS

Special Events highlight the entertainment side of Mad Science! Our educational, fast-paced, high energy, fun and interactive science shows will stimulate your students' minds and spark their imaginations—leaving them more receptive to science learning when they return to their classrooms.

Your children will experience a variety of demonstrations on a number of different science topics that are complementary to the Ontario Science and Technology Curriculum. Please see below for details.

We also provide pre and post event packages (containing activity ideas, resource and vocabulary lists) that are designed to maximize the educational impact of each of our special events.

STRAND	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6	GRADE 7	GRADE 8
Life Systems [LS]	Characteristics and Needs of Living Things **A**	Growth and Changes in Animals	Growth and Changes in Plants	Habitats and Communities	Human Organ Systems	Diversity of Living Things	Interactions Within Ecosystems	Cells, Tissues, Organs, and Systems
Matter and Materials [MM]	Characteristics of Objects and Properties of Materials **C**	Properties of Liquids and Solids **A**	Magnetic and Charged Materials	Materials that Transmit, Reflect, or Absorb Light or Sound **C**	Properties of and Changes in Matter **A, C**	Properties of Air and Characteristics of Flight **A, B, C, D**	Pure Substances and Mixtures	Fluids **B, D**
Energy and Control [EC]	Energy in Our Lives	Energy from Wind and Moving Water	Forces and Movement **A, B, C, D**	Light and Sound Energy **A, C**	Conservation of Energy	Electricity **D**	Heat **A, B, C**	Optics
Structures and Mechanisms [SM]	Everyday Structures	Movement	Stability	Pulleys and Gears	Forces Acting on Structures and Mechanisms	Motion **B, D**	Structural Strength and Stability	Mechanical Efficiency **B**
Earth and Space Systems [ES]	Daily and Seasonal Cycles	Air and Water in the Environment **A, B, C**	Soils in the Environment	Rocks, Minerals, and Erosion	Weather **A, B, C**	Space **D**	The Earth's Crust	Water Systems

Should you wish your students to experience a number of interactive demonstrations and hands-on activities for a single curriculum topic, please refer to our Workshop Menu and Resource Matrix or log onto **www.madscience.org/windsor** for complete workshop descriptions.

SPECIAL EVENT HIGHLIGHTS:

A: FIRE, WIND AND ICE

Explores "magical" chemical reactions, the dynamics of air pressure and the wonders of dry ice.

- Investigate the chemical and physical properties of matter.
- See paper burn instantly as you learn about combustion.
- Watch as Bernoulli's Principle is used to levitate a ball in mid-air!
- Learn about ice that never melts.

B: UP, UP AND AWAY

Introduces the properties of air and the principles of air pressure.

- Discover the power of air pressure.
- Learn what makes a hot air balloon fly.
- Watch as we use our giant vortex generator to blow smoke rings.
- Take a ride on the Mad Science hovercraft.

C: SPIN, POP, BOOM!

An introduction to chemistry and physics that presents a variety of principles including momentum, centripetal force and sound producing chemical reactions.

- Be amazed as we defy gravity using water.
- Listen as we use combustion to produce sound.
- Be amazed as we mix two liquids to create a solid foam extra "hand".
- Look as we use an exothermic chemical reaction to let foam fly into the sky.

D: MARVELS OF MOTION

This interactive show is all about the fundamentals of moving science, particularly Newton's Three Laws of Motion.

- Learn about Inertia, Force, Acceleration, Action and Reaction as you discover Newton's Three Laws of Motion.
- Get the drop on gravity as you learn that it affects small objects, large objects and even objects in motion.
- See how athletes, such as figure skaters, use conservation of angular momentum to spin faster.
- Observe and be amazed when the Mad Scientist unveils our top secret Mad Science Motion Machine.

SCIENCE AND TECHNOLOGY CURRICULUM EXPECTATIONS COVERED:

A: Fire, Wind and Ice

- **LS1:** Compare the basic needs of humans with the needs of other living things [oxygen]
- **MM2:** Describe the properties of liquids, [gases] and solids
- **MM2:** Describe the characteristics of the three states of water and the conditions that cause changes from one state to another
- **MM2:** Changes of state are reversible
- **MM5:** Changes of state are reversible while some chemical changes [combustion] are not
- **MM5:** Interactions between some materials result in the production of a gas
- **MM5:** Identify the three different states of matter and give examples of each
- **MM5:** Identify the characteristic properties of each of the three states of matter (solids have definite volume and hold their shape; liquids have definite volume but take the shape of their container; gases have not definite volume and take the volume and shape of their container)
- **MM5:** Some changes that occur when heat is applied to a material [burning paper] are non-reversible
- **MM5:** Describe physical changes and chemical reactions that can take place in household products and explain how these reactions affect the use of the products.
- **MM6:** Demonstrate understanding that gases expand to fill a space
- **MM6:** Demonstrate that air expands when heated
- **EC3:** Investigate the ways in which different forces [gravity] can change the speed or direction of a moving object
- **EC3:** Describe the visible effects of forces acting on a variety of everyday objects
- **EC4:** Recognize that sounds are caused by vibrations

- **EC7:** Describe the effect of heating and cooling on the volume of a solid, a liquid, and a gas
- **EC7:** Describe the effect of heat on the motion of particles and explain how changes of state occur
- **EC7:** Identify different forms of energy that can be transformed into heat energy
- **ES1:** Demonstrate an awareness of air as a substance that surrounds us and takes up space, and whose movement we feel as wind
- **ES1:** Recognize that water exists in three states on earth (solid, liquid, gas)
- **ES1:** Describe the different uses of water and identify some that are essential for maintaining our health (water is used for drinking and washing)
- **ES5:** Identify patterns in air movement (low pressure and high pressure)

Other Concepts Covered but not Specifically Related to the Curriculum

- Fire Triangle (combustion requires oxygen, heat and fuel)
- Combustion is an exothermic chemical reaction in that it releases energy in the form of light and heat
- Kinetic Theory of Gases (move from high to low pressure)
- Bernoulli's Principle (fast moving fluid has low pressure)
- Freezing, melting, evaporation, sublimation
- Properties of Dry Ice
- Relative Temperature
- Carbonation
- Chemistry, Acids, Bases, Neutral Substances

B: Up, Up and Away

- **MM6:** Demonstrate understanding that gases expand to fill a space
- **MM6:** Demonstrate that air expands when heated
- **MM8:** Recognize and state the relationship between gravity and buoyancy
- **MM8:** Predict the effect of applying external pressure on the behaviour of fluids
- **EC3:** Identify force as a push or pull by one body on another
- **EC3:** Describe the visible effects of forces acting on a variety of everyday objects
- **EC3:** Identify surfaces that affect the movement of objects by increasing or reducing friction
- **EC7:** Describe the effect of heating and cooling on the volume of a solid, a liquid, and a gas
- **EC7:** Describe the effect of heat on the motion of particles and explain how changes of state occur
- **EC7:** Identify different forms of energy that can be transformed into heat energy
- **SM6:** Investigate ways of reducing friction so that an object can moved more easily
- **SM8:** Explain in qualitative terms the relationship between pressure, volume and temperature when a gas is compressed or heated
- **ES1:** Demonstrate an awareness of air as a substance that surrounds us and takes up space, and whose movement we feel as wind
- **ES5:** Identify patterns in air movement (low pressure and high pressure)
- **ES5:** Compare outdoor air movement with indoor air movement (as hot air rises, cold air takes its place; the warmest rooms in a house are usually the upstairs bedrooms)

Other Concepts Covered but not Specifically Related to the Curriculum

- Vacuum
- Magdeburg Sphere
- Pressure (the ratio of the force exerted to the area the force acts on)
- Boyle's Law (at constant temperature the volume of a gas is inversely proportional to the pressure—increasing the volume that a container can hold causes the pressure within the container to decrease)
- Newton's 1st Law (Inertia—things in motion tend to stay in motion while things at rest tend to stay at rest)
- Kinetic Theory of Gases (move from high to low pressure)

- Bernoulli's Principle and Lift (fast moving air over wing creates low pressure while slow moving air under wing creates high pressure, air tends to move from high to low pressure therefore pushing up on or "lifting" the wing)
- Silo Effect (dust explosions)
- Combustion is an exothermic chemical reaction in that it releases energy in the form of light and heat
- Gay-Lussac's Law (pressure is directly proportional to temperature—when a container of gas de-pressurizes, the result is that the temperature of the gas decreases)

C: Spin, Pop, Boom!:

- **MM1:** Demonstrate ways in which various materials can be manipulated to produce different sounds (air vibrating in the long didgeridoo tube has long wavelengths and therefore produces a low sound while air vibrating in the short didgeridoo tube has short wavelengths and therefore produces a louder sound)
- **MM4:** Investigate ways in which different properties of materials affect the nature of sound that they produce (air vibrating in the long didgeridoo tube has long wavelengths and therefore produces a low sound while air vibrating in the short didgeridoo tube has short wavelengths and therefore produces a louder sound)
- **MM5:** Interactions between some materials result in the production of a gas
- **MM6:** Demonstrate understanding that gases expand to fill a space
- **MM6:** Demonstrate that air expands when heated
- **EC3:** Identify force as a push or pull by one body on another
- **EC3:** Investigate the ways in which different forces (gravity, centripetal force, inertia, angular momentum) can change the speed or direction of a moving object
- **EC3:** Describe the visible effects of forces acting on a variety of everyday objects
- **EC4:** Group a variety of sounds according to pitch and loudness and demonstrate how sounds can be modified
- **EC4:** Recognize that sounds are caused by vibrations
- **EC4:** Describe, using their observations, how sounds are produced in a variety of musical instruments (e.g. wind instruments such as Didgeridoo Resonance Tubes) and identify those they like listening to best
- **EC7:** Describe the effect of heating and cooling on the volume of a solid, a liquid, and a gas (heat a gas and it expands and its pressure increases; cool a gas and it contracts and its pressure decreases)
- **EC7:** Describe the effect of heat on the motion of particles and explain how changes of state occur
- **EC7:** Identify different forms of energy that can be transformed into heat energy
- **ES1:** Demonstrate an awareness of air as a substance that surrounds us and takes up space, and whose movement we feel as wind
- **ES5:** Identify patterns in air movement (low pressure and high pressure)

Other Concepts Covered but not Specifically Related to the Curriculum

- Centrifugal Force (fictitious, "fly-away" force)
- Centripetal Force (inward pulling force—object moving in a circle accelerates towards the centre of the circle)
- Newton's 1st Law (Inertia—things in motion tend to stay in motion while things at rest tend to stay at rest)
- Angular Momentum—the movement of objects in a circular path
- Kinetic Theory of Gases (move from high to low pressure)
- Polymer—Polyurethane Foam
- Exothermic Chemical Reactions are reactions that give off energy, usually in the form of light and/or heat
- Catalyst—speeds up a chemical reaction but is not used up in the reaction

D: Marvels of Motion:

MM6: Recognize that gravity does not depend on the presence of air
MM6: Describe how unbalanced forces are used to steer airplanes and spacecraft (e.g. rocket firings to control docking in space)
MM8: Describe qualitatively the relationship between mass and weight (e.g. the mass of an object is constant but the weight of an object varies as the pull of gravity on the object changes)
EC3: Identify force as a push or pull by one body on another

EC3: Investigate ways in which different forces (e.g. magnetism, static electricity, muscular force, gravitational force) can change the speed or direction of a moving object
EC3: Investigate the effects of directional forces (e.g. left push for left movement) and how unbalanced forces can cause visible motion in objects that are capable of movement (e.g. an object pushed over a smooth floor)
EC3: Describe the visible effects of forces acting on a variety of everyday objects (e.g. a toy car goes forward when pushed; a ball falls down when dropped)
EC6: Describe the relationship between electricity and magnetism in an electromagnetic device
SM6: Demonstrate an understanding of different kinds of motion (linear, rotational, reciprocating, oscillating)
ES6: Identify the technological tools and devices needed for space exploration (e.g. telescopes, spectroscopes, spacecraft, life support systems)

Other Concepts Covered but not Specifically Related to the Curriculum

- Balance and Center of Gravity
- Newton's 1st Law of Motion (Inertia—things in motion tend to stay in motion while things at rest tend to stay at rest)
- The relationship between inertia and mass (the heavier that an object is, the more inertia that it has)
- Newton's 2nd Law of Motion (F=MA, the harder you push something, the faster it goes and the further it will travel)
- Newton's 3rd Law of Motion (For every action there is an equal but opposite reaction—e.g. downward thrust from a rocket engine causes the rocket to go up)
- The force of gravity affects everything large or small and even projectiles in motion
- Rotational motion--motion in a circle
- Conservation of Angular Momentum—the closer a given mass is to the centre of spin, the less inertia or resistance to change that is present and the faster the spinning motion [explains why a figure skater spins faster when he or she pulls their arms (mass) closer to their body (centre of spin) as opposed to holding them outstretched]
- Gravity is different on different planets and the larger the planet, the greater the gravitational force