



## **MAD SCIENCE® OF GREATER BOSTON**

### **SCHOOL-AGE WORKSHOP TOPICS**

#### *ATMOSPHERE & BEYOND*

This Mad Science® of Greater Boston workshop takes children on a mission to discover the properties of the air around us and to explore the atmosphere of the Earth and those of the planets beyond. The children will be challenged to keep Arny the Aquanaut dry during an underwater walk, and to create their own sunset. They will mix up various planetary atmospheres one molecule at a time, discover how stars would look in space, and make their own star finder to take home.

#### *BLACK & BLUE OCEANS*

This Mad Science® of Greater Boston workshop combines demonstrations and activities in an exciting exploration of one of life's fundamentals - water - as the children investigate various facets of this exciting substance. Oil can make quite a mess when it ends up where it shouldn't! Discover what damage it causes when it accidentally enters our environment and devise a way to clean it up! Workshop participants will test oil spill clean up techniques in a mock oil spill, and they'll also explore the causes and remedies for acid rain through pH testing and monitoring methods. Each child will take home their own wave modulator to illustrate what they learned about waves and oil and water.

#### *BUGS!*

Welcome to the realm of insects! In this Mad Science® of Greater Boston workshop, the children will be introduced to the world of creepy, crawly creatures that they find beneath their feet through hands-on activities, and interactive and entertaining demonstrations. Participants will learn about insects' unique eyesight, and the way they defend themselves against predators. The children will use their new bug knowledge to build their very own model insect to take home.

#### *CHE-MYSTERY*

Take the mystery out of chemistry! This Mad Science® of Greater Boston workshop introduces children to the world of chemistry through hands-on fun, discussions, and demonstrations. The children will explore one of the most exciting and fundamental sciences by experimenting with and observing various chemicals, potions, and solutions in action. They'll explore the difference between physical and chemical reactions, watch styrofoam reduced to a puddle of goo, and see camphor provide the chemical equivalent of an outboard motor...all chemistry in motion. The kids will then get to apply their knowledge of chemical processes to make their own Mad Science bouncy ball.

### *CURRENT EVENTS*

In this electrifying Mad Science® of Greater Boston workshop, the children explore electricity through hands-on activities and illuminating demonstrations. The children will really use their heads while exploring the existence of a transferable electrical charge as an electroscope, a balloon, and a head are needed for this experiment! Problem-solving and scientific know-how are explored when the children tackle the problem of creating a circuit that will light a bulb, and then turn to a hands-on exploration of more complex series circuits.

### *DINOSAURS*

Let's become Paleontologists and learn about excavating and recovering fossils! This Mad Science® of Greater Boston workshop combines fun demonstrations and activities in an exciting exploration of dinosaurs. We'll uncover facts about dinosaurs—what they were, what they ate, and theories on where they went. The children will examine real fossil casts, and explore the differences in the teeth of plant eating and meat eating dinosaurs. They'll also participate in a mini dinosaur excavation and make a cast of a dinosaur tooth to take home.

### *DRY ICE CAPADES*

This Mad Science® of Greater Boston workshop takes an exciting look at the world of dry ice through a series of interactive and fun experiments. The children will learn about the three states of matter and a lesser known phenomenon called “sublimation”, whereby a solid turns directly into a gas. Dry Ice—the star of the show—will be used in a series of tests, under the guidance of the instructor, from blowing up a balloon without air to seeing a coin “shiver”. They'll learn the secrets behind the bubbling potions found in Mad Science's laboratories while answering the question, “What do you think this weird ice cube can do?” Kids will be amazed by this “cool” class and will take a thermo-color changing cup home for the experiments to continue!

### *EARTHWORKS*

Find out that the earth beneath your feet is more than meets the eye in this introductory program on Earth science. In this Mad Science® of Greater Boston program, children will become geologists in training as they discover what the Earth is composed of and how various forces combine to create rocks and minerals. They'll also uncover the forces that create earthquakes, the natural faults in the Earth's crust and even how mountains are formed. Participants will build their own sedimentary stacker as a take home to continue the investigation of Earth science.

### *ELECTRICITY*

In this electrifying Mad Science® of Greater Boston workshop, the children will take a tour of the electron freeway. The roadside attractions include hands-on activities and illuminating demonstrations. The children will excite some electrons as they construct circuits and test various materials for conductivity with space-age plasma balls. Problem-solving and scientific know-how are explored when the children create and play an electronic game, and each child will take home a static stick to further their exploration of static electricity.

### *ENERGY BURST!*

In this Mad Science® of Greater Boston workshop, children will explore the fundamentals of energy through hands-on activities and demonstrations that demonstrate both potential and kinetic energy. The children will discover that light itself creates energy. And, they'll also investigate how energy can be conserved, discover the simple principles behind the energy of motion, and build their own rubber band powered rattlesnake egg to help learn all about energy.

### *FUN-DAMENTAL FORCES*

In this Mad Science® of Greater Boston workshop children will find out what makes the world go 'round in an entertaining introduction to the concepts and basics of forces. Gravity...inertia...centripetal force...Who could ever imagine that an introduction to physics could be so much fun? The children will get to experience some of these awesome forces for themselves and experiment with some cool devices to watch the forces at work!

### *HARNESSING HEAT*

This Mad Science® of Greater Boston workshop introduces children to the concepts of heat and heat transfer through hands-on fun, discussions and demonstrations. Kids will learn about and observe the basic properties of heat by play-acting the role of atoms, as well as observing the effects and behavior of warm air and water. The participants will witness a gravity defying candle-lighting, and even take part in a sense-confusing temperature test. The workshop is capped off with a taste bud pleasing demonstration of heat at work, transforming solid sugar crystals into the spun floss of cotton candy!

### *INVENTION-ACTION*

This Mad Science® of Greater Boston workshop introduces children to how inventors work and some famous inventions. Through a hands-on approach, including group brainstorming and an invention activity, the participants will learn that anyone, of any age, can be an inventor. The children will learn about Rube Goldberg's unique machines and will plan out some outlandish machines of their own. This class provides an opportunity to develop scientific skills through inquiry-based instructional methods and each child will take home an Inventor's Notebook to continue planning out their inventions at home.

### *LIFE IN THE SEA*

In this Mad Science® of Greater Boston workshop, children will discover ocean habitats by experimenting with seawater and its unique properties. They will identify creatures that inhabit the oceans and some characteristics that make them able to live a watery life. This workshop provides an understanding of processes at work in the ocean such as food webs and adaptations, and participants will make their own Cartesian Divers to continue underwater explorations at home.

### *LIGHTS...COLOR...ACTION!*

This Mad Science® of Greater Boston workshop takes an exciting look at the world of light, colors, and important related scientific concepts. The children will be treated to interactive demonstrations and hands-on activities, accompanied by entertaining and educational discussions. Using Newton's color wheel, the children will observe and create white light, providing the background for an exploration of color accomplished through several different demonstrations. The children will be introduced to the visible spectrum through a chromatography experiment, and a series of exciting activities will cover both the infrared and ultraviolet components of the spectrum; always an enthralling portion of the workshop.

### *MAD MESSAGES*

In this Mad Science® of Greater Boston workshop, secret messages and special codes will be the means of communication. The children will learn how to send messages to their friends using special codes, and they'll become detectives by using their Mad Science observational skills to solve the mystery of some cool messages and formulas. Each child will bring home their own secret code wheels to code and decode their own mad messages!

### *MAD SCIENCE MACHINES*

Find out how simple machines make our lives easier. In this Mad Science® of Greater Boston workshop, children will get the opportunity to try out different types of simple machines: levers, screws, incline planes, wheels and axles, and pulleys through various hands-on activities in this excellent introduction to basic physical science. They will learn about the role that simple machines play in everyday life, and will apply this knowledge by building their own mini-machine to take home.

### *MAGNETS*

Experience the pull of magnetism! Ever been an atom in a magnet? Find out exactly what magnets like to “hang” out with in this Mad Science® of Greater Boston workshop. Visit the North and South poles and frolic in invisible fields. The children will build cool magnet chains and play with some of the wildest forces in the universe; and each child will bring home a cool magnet contraption!

### *MATTER OF FACT*

This Mad Science® of Greater Boston workshop introduces children to the building blocks of the universe through hands-on fun, discussions and demonstrations. They’ll learn about the fundamentals of chemistry, from atoms to the structure, dynamics, characteristics and possible combinations of simple to complex molecules. The children will learn and observe the difference between physical and chemical changes and examine both atoms and molecules. To cap it all off, participants will find out just how fun polymers can be as they make their very own Mad Science putty.

### *MILKY WAY*

This Mad Science® of Greater Boston workshop offers an introduction to astronomy. What is the Milky Way and how do we know what’s up there? The children will explore the celestial sphere, learn about constellations, and build their own planisphere while discovering the wonders of the Milky Way.

### *MINERAL MANIA*

Peek beneath the crust and uncover what it’s made of—Discover Planet Earth! This Mad Science® of Greater Boston workshop introduces children to the world of geology, including geological formation, classification systems and the fundamental characteristics of rocks and minerals, through hands-on fun, discussions and demonstrations. The children will recreate the process of rock formation and devise ways to identify and classify rocks and minerals. They’ll experience the thrill of panning for gems; and the gems they find, they’ll get to take home and keep for further study and identification!

### *MOVIE EFFECTS*

Sit in a director's chair and discover why science is the real star on the big screen! In this Mad Science<sup>®</sup> of Greater Boston workshop, exciting demonstrations and hands-on activities allow participants to learn about persistence of vision and how that makes all movies possible. The children will investigate the concept of 3-D as the technique was first pioneered using red/blue anaglyph glasses. They'll test out their storytelling skills and their imaginations while learning about how the pros make the images and sounds come to life on screen! The children will use their movie making knowledge with their very own mini flipbook to take home.

### *OPTICAL ILLUSIONS*

This Mad Science<sup>®</sup> of Greater Boston workshop explores the science of optics, refraction, and the biology associated with sight. The children will have fun fooling their eyes with a variety of optical illusions: some old favorites like candlestick or the two faces, some new like Einstein's funny face. They will also test out some optical illusion contraptions like a camera obscura and mirror mirage. After an instructional demonstration of the science and design behind periscopes, the children will construct their own periscope to take home.

### *SCIENCE OF ART*

Get your left and right brains working together and discover the links between science and art. In this Mad Science<sup>®</sup> of Greater Boston workshop, children will explore the features that are important to both artists and scientists. They'll mix and separate colors, uncover art forgeries, and discover that science is an important part of art. They'll learn about distorted images and even make a distorted image of their own to take home.

### *SCIENCE OF MAGIC*

How'd they do that? It must have been magic! No... It was the clever application of scientific knowledge and known phenomena! This Mad Science<sup>®</sup> of Greater Boston workshop introduces children to the science of magic through demonstrations and activities. The children will be dazzled by a little "magic" in our exciting opener... But is it really magic? We'll challenge the participants to employ their minds and senses to determine the explanation for our tricks, and they'll learn the secrets behind some famous magic that they can recreate for themselves. Water can defy gravity? How'd they make those crazy diaper commercials? Want to see a card trick? This class shows that with examination, and by applying our senses and rational faculties, we can discern a rational, scientific explanation for sleight of hand. Each child will learn a neat magic trick and take home the materials they'll need to do it!

### *SEEKING OUR SENSES*

This Mad Science® of Greater Boston workshop introduces children to how our senses work and function. Through hands-, eyes-, and ears-on demonstrations and activities, the participants will learn to be *sense-ative*. The children will test their vision with our mind-boggling illusions, navigate their nerves and give their ears a hand by amplifying sound with our very own Mad Science megaphones. They will test their tasters and learn just what their noses know.

### *SLIPPERY SCIENCE*

Goop, ooze and slime are three words sure to put a smile on any child's face! This Mad Science® of Greater Boston workshop introduces children to the world of polymers through hands-on fun, discussion and demonstrations. The children will explore several different polymers; from common Tupperware to our "Mystery Polymer" and ooze that seems to defy gravity. They'll get to touch, observe and talk about what makes up a polymer, and best of all, each child will make his or her own batch of colorful, ooey-goey Mad Science Slime to take home!

### *SONIC SOUNDS*

This Mad Science® of Greater Boston workshop introduces children to the exciting world of sound and sound waves. The children will explore sound waves and how the speed and size of the waves affect the pitch of the sound, and we'll demonstrate how sound travels faster through solids than through water or air. They'll get to listen to sonic bangers chime, make vibrations with tuning forks, and learn how the human ear drum works. Children will bring home a sound amplifying toy to test out their new understanding of sound waves.

### *SPACE TRAVEL*

This Mad Science® of Greater Boston workshop introduces children to the dynamics of rocket flight. The class will learn about the basic parts that make up a rocket in a discussion that lays the foundation for the exploration of the three parts of a rocket flight. To both illustrate and entertain, the children will have a fun balloon-rocket race. We'll learn about basic pre-launch safety procedures, and then the children will get to witness the grand finale—the launch of a model rocket!

### *STUNT PLANES & GLIDERS*

This Mad Science® of Greater Boston workshop will fly the children through the basics of flight and aerodynamics before making practical use of this knowledge when students build their own stunt planes and gliders, including a mind-boggling football plane and awesome loop-flying stunt plane. Stunt Planes & Gliders is a fun combination of practical and theoretical knowledge, and a great introduction to the basics of aerodynamics. The children will learn about the four forces that affect a plane in flight: drag, gravity, lift and forward thrust. They will witness, experience, play with, and use these forces to their advantage in the construction of incredible paper planes.

### *SUPER STRUCTURES*

This Mad Science® of Greater Boston workshop gives children insight into the world of architects and engineers. The children will discover the strengths of triangles, cylinders, and arches. They'll see how triangles and arches provide the greatest support in construction as they experiment with these two shapes and use them to strengthen and reinforce structures. Then they will embark on an exploration of the rigidity and stability of structures, from the Dixie cup that supports dozens of times its weight, to teetering Jenga towers. Finally, the children will have a chance to apply the knowledge they've gained when they attempt to build an "earthquake-proof building".

### *TANTALIZING TASTE*

In this Mad Science® of Greater Boston workshop, interactive and hands-on activities help us explore one of the most enjoyable of all the senses and the delicious biology behind our taste buds. After an entertaining discussion that covers how and why we taste, the children will better acquaint themselves with their primary taste organ—their tongues. We'll explore the question of whether the tongue is the only taste organ when the kids take the smell test. Participants will also observe how their favorite sodas are made, and will put their taste buds to the test for a famous taste test challenge.

### *THE DIRT ON GARBAGE*

When you throw something out, what happens to it? Where does it go? How does it affect you, what can you do? In this Mad Science® of Greater Boston workshop, we'll explore the answers to these questions! Kids will examine commonly encountered materials and discover the rate at which they decompose. They will have a chance to study materials that don't decompose, and their new, environmentally-friendly counterparts. Finally, environmental consciousness will be raised when we explore a "lake", and the things that could end up in it when people aren't careful with their garbage! Each child will make and take home environmentally friendly art.

### *UNDER PRESSURE*

This Mad Science® of Greater Boston workshop introduces children to the exciting science of aerodynamics and a host of associated scientific concepts, including air pressure, the science of flight, Bernoulli's Principle, and Newton's laws of motion, through an exciting collection of demonstrations and hands-on activities. The children will be challenged to stop and consider air, its effects on our surroundings, and its significance to us and to life on earth. The focus will then turn to air pressure beginning with a fun demonstration that illustrates the concept of imbalanced pressures. The children will enjoy an enthralling story of the Viking ship, and witness and reproduce the phenomenon of the amazing leaping Ping-Pong ball. They'll also enjoy an exciting series of hands-on activities using a blow dryer and Bernoulli's Principle to perform gravity-defying feats!

### *WALLOPING WEATHER*

Welcome to the wild world of weather! In this Mad Science® of Greater Boston workshop, through hands-on activities and exciting demonstrations participants will investigate why it rains, what causes lightning and even how weather can be predicted via a science called meteorology. They'll step into the shoes of a meteorologist and create some of their own regional weather forecasts, and they'll make a UV bead bracelet to take home so they can continue to explore the amazing world of weather.

### *WATTS UP*

This Mad Science® of Greater Boston workshop introduces children to the world of electricity. They will observe and learn the basic properties of static electricity in a series of demonstrations that lay the foundation for both an explanation and demonstration of lightning formation. Using our Van de Graaff generator and a few simple materials, the Mad Scientist will demonstrate the ability of an electric field to light up a fluorescent bulb, the process of grounding, and how to make gravity-defying streamers! Each child will take home a static stick to further their exploration of static electricity.

### *WHERE'S THE AIR*

This dynamic Mad Science® of Greater Boston workshop introduces children to the exciting science of aerodynamics and a host of associated scientific concepts – including air pressure and buoyancy – through an exciting collection of demonstrations and hands-on activities. The children will be challenged to stop and consider air, its effects on our surroundings, and its significance to us and to life on Earth. The focus will then turn to air pressure beginning with a fun demonstration that illustrates the concept of imbalanced pressures and all sorts of neat stuff involving Bernoulli's Principle. The children will each take home a paper helicopter to demonstrate some of the principles they learned.