



Mad Science of Pittsburgh

945 Old Mill Road, Cheswick, PA 15024
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Program Descriptions

Crazy Chemworks

Shake up a flask of fun in the lab as a junior chemist! This hands-on and interactive program of chemistry for children ages 5-12 is packed solid with cool reactions. Students put on goggles and change liquid to solid and back again. They get to handle laboratory tools, build and break molecules, and pick up some tricks on chemical changes.

(C1) In **Lab Works**, students become lab scientists-in-training. Each student will learn to manipulate an assortment of lab equipment. They will learn to transfer droplets using a pipette, and larger quantities using a stirring rod. They will also learn to swirl with an Erlenmeyer flask.

(C2) **Junior Reactors** introduces students to the concepts of atoms and reactions. A demonstration of the differences between physical and chemical reactions is followed by a hands-on series of experiments. The relative size of an atom is introduced in a cutting edge race as the children try to reduce a strip of paper down to its atomic size.

(C3) In **pH Phactor**, students explore the crazy chemistry of acids and bases in this fascinating program on the pH scale. The pH Phactors hydrogen and hydroxide give a colorful introductions and the Phantastic pH test is applied to common household chemicals. Students are challenged to bring a mystery liquid to a perfect pH balance.

(C4) **Slime Time** introduces the Mad Science slime recipe in this gooey chemistry class. Polymer paper clips and cross-linking magnetic marbles will help to examine the key components of slime. Varied concoctions of slime will stir up in scientific style, and the properties of slime will be tested in a team-spirited fashion at the Slime Olympics!

(C5) In **Chem in a Flash**, children take a trip through several fields of chemistry and discover the factors that can change the rate of a reaction. A hands-on demonstration of oxidation is observed. Students experience a balloon-expanding experiment to test limiting reagents. The class wraps up with a color-changing electrolysis demonstration.

(C6) The **Glow Show** class concentrates on how we perceive light. The nature of fluorescence and phosphorescence are unveiled in a black light demonstration. Students are challenged to find fluorescing materials among common objects. Chemiluminescence is demystified using a flashlight analogy.

(C7) In **Super Sticky Stuff** the class begins with a close-up demonstration of how Velcro hook-and-loop fasteners work. This is followed by a hands-on experiment with different types of adhesives. Children learn how to perform a ranking test, and determine the optimal glue to use on various materials.

(C8) **Dry Ice Capades** provides children the opportunity to probe the shifting states of matter through a series of engaging demonstrations. Students observe a shift of states from solid to liquid right before their eyes. Dry ice - the star of the show - under the guidance of the instructor, demonstrates the concept of sublimation.

Minerals, Machines, and Movies

In this program, children will engross themselves in entomology (the study of insects) and search for clues to help crack a case. They will have the chance to inspect fluorescing minerals and see how simple machines lighten your load. They will also discover why science is the real star of the big screen and move out of the way of motorized toys. Finally, they will stage a statically charged indoor storm and go on a nutrient hunt.

(M1) In **Bugs!** students get engrossed in entomology! They find out that insects are arthropods and inspect authentic insect specimens. Insect anatomy is introduced and examined up-close. A container of creepy crawlers is divided into insects and non-insects. An ultraviolet powder demonstration shows how insects spread pollen. Students examine a bag of insect defenses.



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(M2) In **Detective Science**, children use science to crack a case! The crime happens just before the Bustertown bakeoff. Mr. Baker's big, fat, chewy, chocolate chip cookie is sabotaged and his recipe is stolen. Analyzing all the evidence is what helps pinpoint the perpetrator.

(M3) In **Earthworks**, children dig-in to Earth science! Earth's layers are introduced with a spotlight on its outer rocky layer. Children check out three rock samples to find out how they were made and where they were formed. They inspect minerals with an ultraviolet light to see them fluoresce. They model the moving plates that cause bends and breaks in the Earth's rock layer.

(M4) In **Kitchen Chemistry**, children get clued in on the chemical reactions that occur when they prepare, analyze, and digest their food. The class gets cooking with a color-changing solution display. Children divide common kitchen activities into chemical and physical reactions. A balloon blow-up demonstration helps them discover that yeast makes bread rise. Children test food samples in search of nutrients, starch, and protein.

(M5) In **Mad Machines**, children discover how simple machines make our lives easier. They learn about the six different types of simple machines: the screw, lever, inclined plane, wedge, pulley, and wheel and axle. A large child-operated pulley system demonstrates how pulleys help us move heavy objects easily.

(M6) **Movie Effects** gives children a chance to sit in the director's chair and discover why science is the real star on the big screen. Children discover the science behind the effects from their favorite movies. Children investigate 3-D technology. Motion pictures come alive with a spinning praxinoscope.

(M7) In **Science of Toys**, children test, play, and ponder over what makes toys work. They spin into action with kinetic toys. Children balance toy bugs and birds to reveal their centers of gravity. They learn that opposites attract with magnetic toys and then take a turn at creating a gear train.

(M8) In **Walloping Weather**, children get weather-wise in this climate-controlled class! Children try out tools that meteorologists use to measure weather. They create three-day weather forecasts for cities around the world and stage a statically charged indoor storm.

Animals, Energy, and Robots

Explore the energy of motion and life under the ocean's surface in this fast-paced program of science fun! Learn about robots, green energy sources, Newton's three laws of motion and much more! Children build their own Robot Hand and explore renewable and non-renewable resources for power generation. They will explore the animal kingdom and learn about the life cycles of their favorite creatures.

(A1) **All About Animals** brings children into the amazing animal kingdom! Children get hands-on with real tooth and claw replicas. Children see what's inside animals and discover which animals are truly spineless! Organizing a wide range of creatures teaches how scientists classify everything from elephants to arachnids.

(A2) **Energy Burst** is an energetic class that explores energy transfer and energy conversion! Children jump and push up to reach their potential and use wind-up toys that swim, hop and flip. Children spring into action with poppers, Boinks, and jumping bugs. Pulling back a car lets children control how far it goes.

(A3) In **Get Connected** children take on telecommunications with this class! Interactive activities include seeing the sound of your voice and testing out telephone lines. Children chat on their own telephone network, find the limits to low-power radio signals, wind through a cell tower relay, and learn how to track cell phone users.

(A4) **Life in the Sea** plunges children into the depths of ocean life. Children explore different ocean ecosystems and learn about the plants and animals that live there. They compare shark and whale teeth, and measure the size of these incredible predators. Hands-on activities teach the interconnectedness of an ocean food web.



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(A5) **Mix It Up** challenges children to branch out into the physical aspect of chemistry. A four layer mixture shakes up the idea of water and solutions. Children pick up concepts of physical mixtures, solutions, and suspensions with sorting activities. Children carry out a salting out technique to pull soap out of solution.

(A6) In **Moving Motion** children catapult into Newton's three laws of motion! They yank a cloth from under dishes and send crash test dummies flying. They adjust the mass of two identical cars and learn how heavier objects need a bigger push to move the same distance.

(A7) In **Radical Robots** children become wrapped up in the world of robotics! Volunteers act out a robot, remote control device, and an automaton. Children circulate through learning centers experience different robots! A soft and snuggly robotic seal pup is passed around for all to pet.

(A8) **Super Power Sources** has children embark on a quest for alternative energy sources. They harness the sun's heat with a parabolic mirror and act as power hunters to pinpoint renewable and nonrenewable resources. A small scale demonstration reveals the enormous potential for fuel cells.

NASA: The Academy of Future Space Explorers

From our Earth's atmosphere to the outer reaches of our solar system, this hands-on program sends participants on a quest for exploration! Comets, planets, stars, and more are all waiting to be discovered. Learn about the four forces of flight, the challenges of space travel, and participate in a rocket launch!

(N1) In **Planets and Moons**, the class set off on a voyage to discover the Solar System. Students impersonate the planets to compare their sizes and distances from the sun, recreate a solar and lunar eclipse, and become particles on a voyage into a planet's core.

(N2) **Atmosphere and Beyond** has students discovering the properties of the air around us and explore the atmosphere of the Earth and those of planets beyond. Students will be challenged to keep Arny the Aquanaut dry during an underwater walk, and to create their very own sunset.

(N3) In **Space Phenomena**, students will explore the phenomenal events that take place in the night sky. Children will create their own impact craters, and observe model meteors fall through a model atmosphere.

(N4) **Sun and Stars** has students investigating the Sun, distant stars, and the galaxies they form. Children will explore stellar life cycles, create new solar systems, and make their own constellations.

(N5) In **Rocket Science** students will follow a detailed construction plan to build their very own model rockets while exploring the science of rocketry.

(N6) In **Space Travel**, students will launch their investigation of rocket propulsion using the compressed air inside balloons for thrust. The class will race balloon rockets, be challenged to devise a balloon-powered rocket car, and experiment with the fast-moving air produced by spinning propellers.

(N7) **Space Technology** starts with an exploration of space-related technologies used on Earth. Students will help laser light through a maze and use principles of radar technology to find hidden mountains. From there, it's out into space with the launch of a satellite - at the edge of their desks!

(N8) In **Living in Space** students will set out on a mission to investigate life in space. Children will see the special adaptations needed to live in space, learn about mission training techniques, and participate in the construction of a model space station.



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Red Hot Robots

A session of fun with amazing robots! Learn about the uses of robots in our world and spend time experimenting with super cool red-hot robots. Discover the science of circuits and how robots use sensors to explore things around them. Use your skills to build your very own working robot to take home with you!

- (C1) **Ready for Robots:** Children will explore the fundamentals of robotics and discover how robots are used through activities and games. They will begin to build their very own robot that they will take home at the end of the week.
- (C2) **Circuit Science:** This program will explore the “nuts and bolts” of robots as children will build simple circuits, test for conductors and non-conductors and discover how switches work.
- (C3) **Use Your Common Sensors:** Children will explore the concept of sensors and discover what they enable a robot to learn about its environment. They will play games that involve their senses and do activities that involve communication.
- (C4) **Robots 101:** Students will learn about Asimov’s “Laws of Robotics” and applications of robotic technology in this fun-filled program. They will continue building their Robot and play a robot relay game.
- (C5) **Advanced Robotics:** Children will complete the building of their robots and spend time using their imaginations to create robot designs of their own. They will discover how to program robots via a sequence of commands. Each child will take home their robot to continue their exploration of robotics at home.

*Each individual Red Hot Robots topic can span 2 1-hour sessions

*This program can be adapted for grades 1-8

Eureka!

Overcome a series of challenges using basic materials, simple machines, tips from famous inventors and most important of all – your mind! Create catapults and forts, build shelters, bridges, and learn about density. While Thomas Edison said “invention is 10% inspiration and 90% perspiration,” this program is 100% FUN!

Rock, Paper, Scissors (E1): Inventing means curiosity! Leonardo da Vinci started as an artist and developed many scientific observations that he recorded in his notebooks over the course of his lifetime. Children learn about his many discoveries and try their hand at his experiments including writing notes backwards, measuring human proportions, building a self-supporting arch bridge and catapults. The budding inventors bring home their da Vinci designs and devices at the end of camp.

Whiz Kids (E2): Inventing means practicality! Inventions and patents to protect an invention were very popular in the late 1800s. Inventors Alexander Graham Bell, Thomas Edison and Nikola Tesla were locked in several battles over electrical inventions of their era. Children work together to form circuits and recreate Tesla's bright atmosphere for the 1893 World's Fair. They talk about sound and learn that anyone can be an inventor. The class moves from simple devices to Rube Goldberg devices and the children perform as parts of a complex human-machine. The children prepare a patent proposal and receive a patent certificate at the end of camp.

Shipwrecked (E3): Inventing means necessity! Archimedes and Benjamin Franklin both created devices to make their society function more smoothly. This week puts children on a deserted island on which they must work together to invent a means for collecting food and water, build shelters, bridges, and learn about density. They use the tools at hand to write messages to send in a bottle and witness a volcanic eruption. The children eventually design a boat to escape the island and bring it home.

Think Fast (E4): Inventing means cooperation! Orville and Wilbur Wright worked together to develop the first self-controlled motorized flying machine. Their team efforts also lead to improved bicycle pedals and faster sleds.



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Children review technological advances in flight and work together to produce improved paper plane designs. They will work as a group to put historical flight events in chronological order. The children then step into space by launching self-built rockets and loading a payload capsule puzzle. These flight fanatics go home with a squadron of paper airplanes for further test flights.

Science Fiction (E5): Inventing means dreaming! Jules Verne and Isaac Asimov wrote about things that would be available in the future. These science fiction writers developed the reality of their current technology into future possibilities. The children develop submarines that rise or sink, wind-up space stations, and design safety capsules for payloads returning from space. They follow a telecommunications timeline and develop one for transportation. The children decipher fact from fiction and play a future-based bingo game. These future inventors get a lesson on lasers, build a light stick and work on protecting a space ship from damaging space rays. The camp wraps up with a robotic relay and the children take home dreams of the future and new planets to explore.

*Each individual Eureka! topic can span 2 to 5 1-hour sessions

Secret Agent Lab

Develop your special agent and detective skills in this super hands-on program! Uncover the science involved in evidence gathering and analysis. Sharpen your secret agent skills and discover how chemistry and the science of forensics can come to the aid of a secret agent. Identify and collect evidence - from fingerprints to tracks to trash! Secret agents-in-training will use science and awesome technological tools to connect the dots and help sniff out the suspects in this investigation into the science of sleuthing.

Discover Detection (S1): Step into the shoes of a detective—uncover the science involved in evidence gathering and analysis. Discover what it takes to be a detective in this hands-on look at detective science. Using powers of observations and your Inspectikit, you will have all you need to get started on detective adventures.

Spy Academy (S3): Look out 007—the Mad Science Spy Academy is in session! Students will make and take home their own Secret Code Breaker to communicate stealthily at home, like real spies. Get into gear with Agent Undercover and learn what it takes to be successful in the spy world.

Sleuths on the Scene (S5): Suspects, schematics, and sleuths... oh my! Connect the dots using science to help solve a crime in this hands-on investigation at the science of sleuthing. Test your skills and learn how the pros do it through careful observation and techniques to handle evidence properly. Using your Whodunit Kit take home, you can practice the skills of recall and observation.

Funky Forensics (S7): Evidence collection and puzzle making will lead you to understand why forensic scientists like to understand the complete picture before they make decisions. Got clues? Analyze clues and get hot on the trail of a culprit with the Crime Lab program. With the Spynoculars take home, you can safely observe clues from afar.

The Science of Security (S9): Become a super spy and learn clever ways of performing tasks in this hands-on view at the science that spies use. Put your spy skills to the test by building your very own security system and challenging others to crack the code! Discover what it takes to keep things safe and how technology works in the spy game! Use your Spyglasses to observe and take turns on short surveillance shifts to test your observation abilities.

*Each individual Secret Agent Lab topic can span 2 1-hour sessions



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*****NEW for 2019!*****

Mission: Code

Join us in an online game that teaches programming by helping campers recognize the patterns and sequence structures involved in writing a line of code. Playing as a robot, your task is to get through each level, collecting stars or destroying rubies by creating a sequence starting with directional arrows, brackets and a hammer. As you advance, you'll have more obstacles in your way and get more tools to be able to make your way around more complex levels. You can even create your own level!

[More details here](#)

*Ideal for kids grades 2nd-6th

Grossology: The Science of our Bodies

This program offers a chance to explore just how gross our amazing bodies are! Discover cool chemical reactions, and get right down to the microscopic level to discover the stuff we're all made of—cells! Venture inward on a journey down the “Organ Trail” and explore all our body systems. Create an organ apron and a model lung to take home. Finish the week with an introduction to some of the gross body chemistry we all need, including burping, farting, spit and why we need mucus - make your own brain goo to keep!



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Workshops

*Ideal for libraries, in-class field trips, kicking off or wrapping up a science unit, child care centers, and more!
Any of the programs described above are also available upon request.*

PK- Grade 2

Dinosaurs!

Investigating the habits, needs and characteristics of dinosaurs leads to the exploration of the fossilization process. Hand-on activities assist students with their understanding of fossils and dinosaurs. Students will find out how big dinosaurs really were and make a cast of a dinosaur tooth.

Seeking our senses

Seeking our Senses is an introduction to how our five senses work and function and the ways in which we use them in our everyday lives. Do you really see what you think you see? What made that noise? These hands-on activities will make students more aware of how they perceive the world around them!

Where's the air?

Be amazed at the power of air around us. Use a vortex generator, watch an aluminum can implode, and make your own paper helicopter to take home.

Grades 3-6

Electricity

Take a tour on the electron freeway! The class will learn about conductors, insulators, transistors, and other elements in the world of circuit electricity. After learning the basics, students will be challenged to electroplate a nickel with copper!

Mineral Mania

This workshop provides students with an introduction to geology, including an understanding of the geological formation processes, classification system, identification methods, and physical properties of rocks and minerals. Hands-on activities encourage students to interact with the concepts presented.

Scientific Method

Have you ever wondered how scientists formulate questions, make predictions, develop and perform experiments, collect and analyze data, and draw conclusions? In this hands-on lesson, students will learn all about physics while designing their own experiment.

*Each topic is one hour of programing, unless otherwise stated.

**Each topic is available as part of an after school program, or as a stand-alone workshop. Workshops, however, do NOT include take home experiments.

***Each topic is geared toward students grades K-6, unless otherwise noted.