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Thank you for downloading the Study Guide to go along with the performance presented by Arts On Stage. The last page of this Study Guide is a **Letter to Families** for you to send home with the child that includes information on what they saw to encourage parents to ask their child about the field trip.

Please direct any questions or correspondence (letters to performers from staff and/or students) to Arts On Stage. Make sure you note what performance and we will make sure they get into the right hands.

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Presenting Live Professional Theatre Field Trips for Students & Families

Super Scientific Circus



Study-Guide

Nature and Purpose of Program

The Super Scientific Circus is a program designed to help students understand that science can be appreciated in everything we see and do. We believe that science can be and is fun!

The program features circus skills, magic tricks, comedy and mime to illustrate fundamental scientific concepts such as gravity, the center of gravity, air pressure, the speed of sound and light, ultraviolet light, centripetal force, airfoils and more.

During the program students learn:

- how to make their own boomerang
- why a whip cracks
- how to put a needle through a balloon
- how ultraviolet light is different from white light
- how to balance a broom in the palm of your hand
- why spinning objects defy gravity
- why bubbles are always round

Ideas for Discussion

- The vocabulary list covers concepts that are either directly addressed or implied by the program. Review some of these terms and concepts with the students.
- What are some of the important scientific discoveries that students can think of? Who are some of the important scientists, and what have they discovered about the world we live in? (The two scientists mentioned by name in the show are Albert Einstein and Isaac Newton). How do scientific discoveries affect our daily lives?
- Is laughter valuable and does it contribute to learning? How does Trent the Mime use his face and body to elicit laughter. Why is the relationship between Trent and Mr. Fish so funny? (It is an historical relationship going back to the time of jesters and kings.) With whom do the students identify?

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VOCABULARY

Physics: The study of matter, energy, motion and force.

Physicist: A scientist who specializes in physics. Albert Einstein and Sir Isaac Newton are considered the greatest physicists of all time.

Matter: Any object. Anything that takes up space and has weight.

Force: A push or pull on an object. Gravity, electricity, and magnetism are invisible forces that act from a distance. Hitting a ball with a bat is a visible force that acts in contact.

Motion: A change of position wherein an object comes closer or moves farther away from another object.

Inertia: The resistance to change in motion. An object at rest wants to stay at rest unless some force moves it. A moving object wants to keep moving unless some forces stops it.

Friction: The resistance to motion between objects that touch. This is the force that causes a moving object to slow down or stop.

Centripetal Force: Any force that makes something move in a circle. If we play tether ball, it is the rope that provides the centripetal force to keep the ball moving in toward the pole.

Centrifugal Force: The opposite of centripetal force. A force that tends to move objects away from the center when going in a circle. Centrifugal force keeps the water in a whirling bucket from spilling out.

Gravity: An invisible force that pulls downward on objects. Gravity is stronger on earth than it is on the moon. There is no gravity in *outer* space.

Balance: When the downward pull of gravity is equal on all sides of an object, so it does not fall.

Center of Gravity: The point at which an object will balance. The weight of the object seems to be centered on that point.

Energy: The ability to do work—to make an object move.

Light: A form of energy that allows us to see. The sun is the greatest source of light on earth.

Refraction: The bending of rays of light. When light bends, or refracts, it sometimes creates a rainbow or spectrum. A magnifying glass works by refracting light through a lens.

Spectrum: The colors found in a rainbow of light - red, orange, yellow, green, blue, indigo, and violet.

Sound: Vibrating energy that allows the sense of hearing.

Speed of Sound: Sound travels through the air at a rate of 761 miles per hour, or 1100 feet per second, or 1225 kilometers per hour.

Sonic Boom: The explosive sound that is created when an object travels faster than the speed of sound. Similar to thunder, a sonic boom is created by supersonic jet aircraft.

Air Pressure: The amount of force that the air exerts upon all objects. Air pressure on the planet earth is 14.7 pounds per square inch at sea level.

Airfoil: Any surface that helps lift or direct an aircraft by making use of air currents. An airplane wing provides lift by causing air to pass at a higher speed over the wing than below it, thereby creating greater air pressure below than above.

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ACTIVITIES

Needle Through Balloon

Demonstrates: Air pressure and polymer effect.

You will need: Balloon, Scotch tape, shishkebob skewer or long pin.

Activity:

1. Blow up the balloon as much as you can, then let a third of the air out so it feels spongy.

2. Tie the balloon closed.

3. Put two squares of Scotch tape on opposite sides of the balloon.

4. Slowly push and twist the pin into the balloon through one piece of tape and out through the other.

Your balloon won't pop even with a pin through it!

Making a Boomerang

Demonstrates: Air speed, aerodynamics, and air pressure

You will need: Cardboard pizza box, scissors, ruler, marker.

Activity:

1. Take a 12" ruler, and trace around it on a pizza box.

2. Turn the ruler perpendicular to the tracing and trace it again.

You will have drawn a symmetrical cross.

3. Cut it out, and trim the corners of the edges so the ends are rounded off a little.

4. Bend the ends of the cross up a little.

5. Go outside.



6. Hold your boomerang straight up like the statue of liberty. The curves should face you.

7. Throw it into the air! You don't need to throw hard, but do throw in an upward direction.

Remember, it needs to start perpendicular to the floor. It won't work if you throw it on its side.

8. Catch the boomerang by letting it float down into an open hand, so you don't crush your boomerang.

9. Repeat. Have fun!

Balancing Objects

Demonstrates: The center of gravity.

You will need: A stick at least two feet long, a broom, a plastic baseball bat or a peacock

feather.

Purpose: Try to balance an object in your hand.

Activity:

1. Keep your palm flat or your finger straight.

2. Place the object you are going to balance in the palm of your hand, or on the tip of your finger.

3. Look at the top of the object, not at the bottom.

4. Let go of the object with the top hand, then move your bottom hand so that the bottom of the object stays directly underneath the top.

5. Don't stand still. You may have to move around to keep your hand under the top.

6. Practice balancing things on your chin, elbow and foot.

Finding the center of gravity is essential to all balance. See what else you can balance! Long things are easier to balance than short things. And remember, always watch the top and keep the bottom directly underneath it.



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Reading List

There are a plethora of books about science for children. A search on Amazon.com will yield 48 books. A few of our favorites are:

- *Janice VanCleave's Physics for Every Kid: 101 Easy Experiments in Motion, Heat, Light, Machines, and Sound* by Janice Pratt VanCleave: John Wiley and Sons, Inc., 1991.
- *The New Way Things Work* by David Macaulay: Houghton Mifflin/Walter Lorraine Books, 1998.
- *Teaching Children About Physical Science: Ideas and Activities Every Teacher and Parent Can Use* by Elaine Levenson: McGraw-Hill, 1994.
- *The Everything Kids Science Experiments Book: Boil Ice, Float Water, Measure Gravity—Challenge the World Around You* by Tom Robinson: Adams Media Corp., 2001.



Trent The Mime juggles soapbubbles.



Mr. Fish and his table of tricks.

The internet will also provide a wealth of information. A Goggle search of “science for children” will turn up 319 million links. Although we haven’t yet examined all of them, one good one is:

- www.ed.gov/pubs/parents/Science/index.html

About the Performers

Mr. Fish, born John James Lepiarz, is a long-time circus performer. He toured for seven years with New York’s Big Apple Circus. He has appeared on national television on HBO and ABC’s *Great Circus Performances of the World*. A graduate of Oberlin College, Mr. Fish is the proud father of four children.

Trent Arterberry, mime extraordinaire, has performed at thousands of schools, theatres and festivals. He has performed at New York’s Radio City Music Hall, headlined on the QE2 and SS Norway, and was named College Campus Performing Artist of the Year. Trent is the father of two daughters and a new baby son.

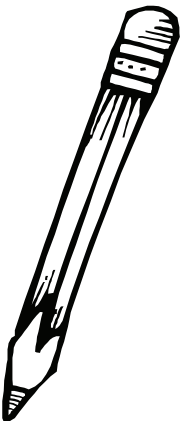
Visit www.TrentTheMime.com

Dear Family,

Today, I saw a live, professional theatre performance presented by Arts On Stage called, Super Scientific Circus. This performance proved that science can be fun by using amazing circus skills involving boomerangs, bubbles, beach balls, bullwhips, magic and mime. We learned about friction, inertia, centrifugal force, aerodynamics, sonic booms, air pressure, ultraviolet light, how to make and throw a boomerang, how to blow giant soap bubbles, and how to put a needle through a balloon. Attending a live performance is very different from watching a television show or a movie. Please ask me about my favorite moments and science experiments. I would like to tell you all the things I learned and remember best.

Love,

Child's Name



We welcome you and/or your child's comments. Artwork is always appreciated too! Contact information below.



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