



**“Eureka!”** is the thrill of discovery, that pulse pounding satisfaction that comes from finding something new. Oklahoma Museum Network’s Eureka introduces visitors to the adventure of science exploration in a series of twelve interactive exhibits. A large scale turntable and a string and pulley system open up the world of dynamics and instill a sense of wonder as visitors manipulate disks, balls and string into complex moving patterns. Hand-held video microscope provides a close up look at the unique structures in our environment. Infrared and ultraviolet light stations fire the imagination and a large, ominous looking bed of nails invites visitors to take a risk and capture the drama of science.

OKLAHOMA  
**museums**  
NETWORK

FUNDED BY THE DONALD W. REYNOLDS FOUNDATION

## Summary of Exhibits

EXHIBIT	CONCEPTS	EXHIBIT DESCRIPTION
<b>Rope Squirter</b>	<ul style="list-style-type: none"> <li>• Rotational Dynamics</li> <li>• Newton's Laws of Motion</li> <li>• Angular Displacement</li> </ul>	A loop of string is thrown by a pulley attached to a spinning motor. Visitors twist the motor, causing the string to move in interesting ways.
<b>Turntable</b>	<ul style="list-style-type: none"> <li>• Coriolis Effect</li> <li>• Newton's Laws of Motion</li> <li>• Equilibrium and Stability</li> </ul>	The turntable disk rotates like a giant compact disk. Experiment with a variety of metal disks, rings and balls to see how they travel when placed on the moving turntable.
<b>Heat Camera</b>	<ul style="list-style-type: none"> <li>• Thermal Dynamics</li> </ul>	A camera sensitive to infrared light picks up heat and displays it as a large screen color image.
<b>Bed of Nails</b>	<ul style="list-style-type: none"> <li>• Weight Distribution</li> </ul>	Experience the significance of weight distribution by safely lying on a bed of 5,000 nails.
<b>Video Light Microscope</b>	<ul style="list-style-type: none"> <li>• Observation and Comparison of Organic and Inorganic Structures</li> </ul>	Use a 200x hand-held video microscope to view mounted slides or nearby objects
<b>Downhill Race</b>	<ul style="list-style-type: none"> <li>• Distribution of Mass</li> <li>• Acceleration</li> </ul>	Use rings and edge and center-weighted disks to experiment with acceleration rates in this downhill racer demonstration.
<b>Spin Browser</b>	<ul style="list-style-type: none"> <li>• Kinematics</li> <li>• Video Imaging</li> </ul>	Record short video and play it back at various rates from stop frame to hundreds of times the normal rate.
<b>Human Conductor</b>	<ul style="list-style-type: none"> <li>• Touch Switch</li> <li>• Technology</li> <li>• Electricity</li> </ul>	Place a hand on both metal plates to complete a circuit and turn on an oscillator.
<b>Descartes Diver</b>	<ul style="list-style-type: none"> <li>• Buoyancy</li> <li>• Air Pressure</li> </ul>	Two objects in a tall tube of water allow visitors to experiment with the effects of pressure by pulling a lever that stretches or compresses a rubber membrane mounted over the top of the tube.
<b>Three Kinds of Light</b>	<ul style="list-style-type: none"> <li>• Electromagnetic</li> <li>• Spectrum</li> <li>• Properties of Light</li> <li>• Refraction and Lens</li> </ul>	A large lens and test filters permit visitors to feel and see the effects of three kinds of light: visible, ultraviolet and infrared.

EXHIBIT	CONCEPTS	EXHIBIT DESCRIPTION
<b>Magnetic Brakes</b>	<ul style="list-style-type: none"> <li>• Magnetic Properties</li> <li>• Lenz's Law</li> </ul>	A magnet and similar size metal cylinder are mounted inside metal tubes. Turn the tubes to drop the cylinders. The metal cylinder quickly drops while the magnet's fall is slowed by magnetic eddy currents.
<b>One In A Million</b>	<ul style="list-style-type: none"> <li>• Probability</li> </ul>	Find the one yellow bead in a container of 999,999,999 black beads.
<b>Safe Cracker</b>	<ul style="list-style-type: none"> <li>• Probability</li> </ul>	How difficult is it to open a safe that has a four number combination?
<b>20 Questions</b>	<ul style="list-style-type: none"> <li>• Information Processing</li> <li>• Introduction to Artificial Intelligence</li> </ul>	Match wits with an artificial intelligence (A.I.) foe that attempts to read minds in 20 yes/no questions. The system learns each time the game is played.

# PASS Skills by Grade

20 QUESTIONS	SAFE CRACKER	ONE IN A MILLION	DESCARTES DIVER	DOWNHILL RACER	3 KINDS OF LIGHT	MAGNETIC EDDY CURRENTS	VIDEO LIGHT MICROSCOPE	HEAT CAMERA	BED OF NAILS	TURNTABLE	ROPE SQUIRTER	
<b>KINDERGARTEN</b>												
<b>SCIENCE – PROCESS SKILLS</b>												
					•	•	•	•	•	•	•	1.1 Observe, describe, sort, classify objects
			•	•	•	•	•	•	•	•	•	1.2 Participate in simple experiments
•	•	•	•	•	•	•	•	•	•	•	•	1.3 Ask questions, make predictions, communicate observations
<b>SCIENCE – CONTENT – PHYSICAL SCIENCE</b>												
				•	•	•	•	•	•	•	•	1.1 Observe, describe, sort, classify sensory attributes of objects
				•		•	•				•	1.2 Compare, describe the properties of objects
			•	•		•					•	1.3 Observe, describe how objects move
<b>SCIENCE – CONTENT – EARTH SCIENCE</b>												
						•						3.3 Observe, describe four seasons characteristics















ROPE SQUARTER
TURNTABLE
BED OF NAILS
HEAT CAMERA
VIDEO LIGHT MICROSCOPE
MAGNETIC EDDY CURRENTS
3 KINDS OF LIGHT
DOWNHILL RACER
DESCARTES DIVER
ONE IN A MILLION
SAFE CRACKER
20 QUESTIONS

**GRADE 6** *continued*

**SCIENCE – CONTENT – PHYSICAL SCIENCE**

											1.1 Objects described as materials/mixtures separated
											1.2 Changes in shape do not alter object's mass
											2.1 Energy exists in many forms/Energy can be transferred

**MATH – PROCESS SKILLS**

											1.3 Formulate problems
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# We're On A Roll

## Teachers Reference Page

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### CONCEPTS

Hands-on activity that allows students to visually explore the design and construction of the simple machines, wheel and axle and inclined plane, as well as the concepts of gravity, acceleration, and mass distribution

### EUREKA GROUP EXHIBIT TIE-IN

Downhill Racer

### MATERIALS NEEDED

- 1 3oz, 5oz, 9oz paper or plastic cups
- Tape
- 4 - 6 Foam core board test ramps 10 x 30"
- Books to set each ramp height at 12"
- 1 Tape measure for each test ramp
- 1 Ruler for each test ramp

# PASS Skills for “We’re On A Roll”

	K	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6
<b>SCIENCE PROCESS SKILLS</b>							
1.1	•	•	•				•
1.2	•	•	•	•	•	•	
1.3	•						
3.1		•	•	•	•	•	•
3.2		•	•	•	•	•	•
3.3		•	•	•	•	•	•
3.4		•	•	•	•	•	•
3.5							•
3.6							•
4.2		•	•	•			
4.3		•	•	•	•	•	•
4.4							•
4.5							•
5.1					•	•	•
5.3					•	•	•
5.4					•	•	•
<b>SCIENCE CONTENT - PHYSICAL SCIENCE</b>							
1.1					•		
1.2			•				
1.3						•	
2.1							•

## Activity Page

Visually explore design and construction of the simple machines, wheel and axle and inclined plane, as well as the concepts of gravity, acceleration, and mass distribution

### MATERIALS NEEDED

- 1 3oz, 5oz, 9oz paper or plastic cups
- Tape
- 4 - 6 Foam core board test ramps 10 x 30"
- Books to set each ramp height at 12"
- 1 Tape measure for each ramp
- 1 Rulers (one for each ramp)

### WHAT TO DO

- 1) Tape the bottom of two 5 oz. cups together to form a set of wheels.
- 2) Place the wheels at the top of the ramp. Hold a ruler in front of the wheels to prevent them from rolling.
- 3) Predict the distance the wheels will travel when the ruler is removed.
- 4) Lift ruler and allow wheels to roll. Record the distance. Repeat the experiment.

Test Run #1	Distance:
Test Run #2	Distance:

Chose a different size cup and make another set of wheels. Repeat the experiment twice. Record your results. Compare your results.

Cup Size	Test Run #	Distance

Why should you test things more than once?

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How could you change the wheel design to make them go farther?

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Why should you test things more than once?

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How could you change the wheel design to make them go farther?

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What else could you use for the wheels?

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What other variables could you change in this experiment

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## Inquiry Challenge

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### MATERIALS NEEDED FOR INQUIRY CHALLENGE

- A variety of paper or plastic cups including 3,5,and 9 oz sizes
- Tape
- A variety of foam core board test ramps 10 x 30" \*\*
- Books to set ramp heights
- 1 Tape measure for each test ramp
- 1 Ruler for each test ramp
- Washers or clay for added weights

### IDEAS FOR ALTERING RAMP SURFACES

Ramps can be covered with a variety of materials to test the effects of friction.

- ▶ Aluminum foil that has been crumbled together and then smoothed out again.
- ▶ Strips or squares of sandpaper of various grits
- ▶ Plastic window sheeting
- ▶ Wax paper
- ▶ Various types and textures of cloth

Choose which variable you want to change from your last experiment.

What do you think will happen? Write out your hypothesis.

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Make a materials list

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Plan your experiment. List your steps.

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Develop a way to record your results.

Gather your materials and construct your wheels.

Conduct your experiment and record your results here.

Analyze your data and summarize your conclusions.

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Share what you've learned.

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# Weighty Steps

## Teachers Reference Page

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### CONCEPTS

Visually introduces the concepts of surface area and weight distribution.

### EXHIBIT TIE-IN

Bed of Nails

### MATERIALS NEEDED FOR "WEIGHTY STEPS" EXPERIMENTS

- 8 8.5- 9 oz. Styrofoam cups
- 1 18 x 18 inch cardboard squares

# PASS Skills for “Weighty Steps”

	K	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6
<b>SCIENCE PROCESS SKILLS</b>							
1.1	•	•	•				
1.2	•		•	•			
1.3	•						
3.1		•	•	•	•	•	•
3.2		•	•	•	•	•	•
3.3		•	•	•	•	•	•
3.4		•	•	•	•	•	•
3.5							•
3.6							•
4.2		•	•	•			
4.3		•	•	•	•	•	•
4.4							•
4.5							•
5.1					•	•	•
5.3					•	•	•
5.4					•	•	•
<b>SCIENCE CONTENT - PHYSICAL SCIENCE</b>							
1.3						•	
2.1							•

# Activity Page

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## MATERIALS NEEDED FOR "WEIGHTY STEPS" EXPERIMENTS

- 8 8.5- 9 oz. Styrofoam cups
- 1 18 x 18 inch cardboard squares

## WHAT TO DO

- 1) Place a cup "open-side" down on the floor.
- 2) Place the cardboard platform on top of the cup
- 3) With a teammate acting as a spotter, slowly step onto the cardboard.

## OBSERVE AND RECORD

What happened to the cup?

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## PREDICT

What would happen if you used 2 cups side by side?

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### Try it and see:

- Place 2 cups "open-side" down on the floor next to each other..
- Place the cardboard platform on top of the cups.
- With a teammate acting as a spotter, slowly step onto the cardboard.

## OBSERVE AND RECORD

What happened to the cups? Did the same thing happen with two?

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## PREDICT

What would happen if you used 5 cups, one near each of the corners and one in the middle of the cardboard?

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**Try it and see:**

- Place 2 cups “open–side” down on the floor next to each other..
- Place the cardboard platform on top of the cups.
- With a teammate acting as a spotter, slowly step onto the cardboard.

**OBSERVE AND RECORD**

What happened to the cups? Why do you think it happened that way?

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**SHARE YOUR RESULTS**

Share your results with the class. Did anyone have different results? Why?

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# Inquiry Challenge

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## MATERIALS NEEDED INQUIRY CHALLENGE

- Plastic
- Paper
- Styrofoam cups in a variety of sizes
- Cardboard in a variety of sizes and thicknesses

- 1) What would happen if you change the size of the cups?
- 2) What would happen if you changed the materials the cups were made of?
- 3) What would happen if a heavier person stood on the cardboard platform?
- 4) What would happen if you used a larger or smaller cardboard platform?
- 5) What other variables could you change?

Choose a question from above, or come up with one on your own that you'd like answered.

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Write out your hypothesis.

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Make a materials list.

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Plan your experiment. List your steps.

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Develop a way to record your results.

Gather your materials.

Conduct your experiment and record your results.

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Analyze your data and summarize your conclusions.

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Share what you've learned.

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## Fiction

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### Leonardo and the Flying Boy: A Story About Leonardo Da Vinci

**Laurence Anholt**

Publisher: Barron's Educational Series, Incorporated  
 Pub. Date: September 2000  
 ISBN-13: 9780764152252  
 32pp

There were no spaceships or airplanes when Zoro was a boy. He lived in Italy during the era we now call the Renaissance, a time when the sky belonged to the birds. But one unusual man dreamed of incredible flying machines. "One day, Zoro," he told his pupil, "people will sail through the clouds and look down at the world below." Zoro was curious. He knew that his teacher did more than merely dream about the future, but was an important artist and inventor. Then Zoro made an astonishing discovery. His teacher was building a mysterious machine. A machine intended to fly!

### Lights Out

**Arthur Geisert**

Publisher: Walter Lorraine Books  
 Pub. Date: September 2005  
 ISBN-13: 9780618478927  
 Age Range: 5 to 8  
 32pp

Mama and Papa are firm: lights out at eight o'clock. But their little piglet is afraid of the dark. They say, "If you can figure something out, go ahead." So the piglet devises an ingenious series of contraptions that allow him to obey his parents while still keeping the light on long enough to fall asleep. Dominoes, tricycles, bowling balls, and baseball bats play a part as each action and reaction leads gradually to the final tug on the lamp's switch. Follow Arthur Geisert's detailed etchings as they reveal each step of kinetic wonder leading gradually to lights out.

### Marveltown

**Bruce McCall**

Publisher: Farrar, Straus and Giroux  
 Pub. Date: September 30, 2008  
 ISBN-13: 9780374399252  
 Age Range: 5 to 8  
 32pp

What's it like growing up in a town founded by inventors? On Saturdays, the adults open the doors of the Invent-o-Drome and give local children free rein to create whatever gadgets they can think up. Hypno-Goggles, a Rocket Chair, a homeworkeaking robo-dog – the can-do kids of Marveltown are never at a loss for ideas. But when an unfortunate short circuit causes a group of giant robot workers to go berserk – and the adults flee for their lives – are the kids ready to put their know-how to the test?

### Probably Pistachio

**Stuart J. Murphy, Marsha Winborn (Illustrator)**

Publisher: HarperCollins Publishers  
 Pub. Date: January 2001  
 ISBN-13: 9780064467346  
 Age Range: 6 to 9  
 40pp

Ever have one of those days? The kind where nothing goes right? During the course of one terrible day, Jack learns all about probability terms such as possible, likely, and certain. Learning to analyze data and make predictions helps kids make good decisions—but will it get Jack pistachio ice cream for desert? Probably not!



## Non-fiction

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### Fun with String

#### A Collection of String Games, Useful Braiding and Weaving, Knot Work and Magic with String Rope

**Joseph Leeming, Charles E. Pont (Illustrator)**

Publisher: Dover Publications

Pub. Date: June 1974

ISBN-13: 9780486230634

Age Range: 9 to 12

171pp

This book covers magic tricks, basic and advanced knots, decorative work, and many useful items to make. From Tam-o-shanters to sandals... Always want to make a rope hammock? Well it is in here! Want to learn to make the cats cradle, and dozens of other string games? They are in here too! Amaze your friends, be the life of the party, and never look at plain old string and rope the same way again!

### How to Think Like a Scientist

#### Answering Questions by the Scientific Method

**Stephen P. Kramer, Felicia Bond (Illustrator)**

Publisher: HarperCollins Publishers

Pub. Date: March 1987

ISBN-13: 9780690045659

Age Range: 8 to 12

48pp

Every day you answer questions—dozens, even hundreds of them. How do you find the answers to questions? How can you be sure your answers are correct?

Scientists use questions to learn about things. Scientists have developed a way of helping make sure they answer questions correctly. It is called the scientific method. The scientific method can help you find answers to many of the questions you are curious about. What kind of food does your dog like best? Is your sister more likely to help you with your homework if you say please? Can throwing a dead snake over a tree branch make it rain? The scientific method can help you answer these questions and many others.

### Inventions

**James Robinson, James Dyson**

Publisher: Kingfisher

Pub. Date: October 2006

ISBN-13: 9780753459737

Age Range: 12 and up

64pp

Today's readers are fascinated by the idea of 'life before technology.' Inventions examines the ideas, machines, and technology that have shaped the modern age. Divided into four chapters—Communication, Inventions in the Home, Transportation, and Microtechnology— it charts the developments that led to the cell phone revolution and reveals the incredible growth of the information superhighway. Stunning computer-generated artwork shows how robotics can be used in complex surgery, as well as in heavy industry, and looks ahead to the propulsion technology that will one day take human beings to Mars.

### I Wonder Why Zippers Have Teeth and Other Questions About Inventions

**Barbara Taylor**

Publisher: Kingfisher

Pub. Date: August 2003

ISBN-13: 9780753456651

Age Range: 5 to 8

32pp

Ever wondered who invented the flush toilet? Or how people kept food fresh before we had refrigerators? Or what plant inspired the design for drinking straws? Or why people want to invent things in the first place? Then this is the perfect book for you, or for any curious kid who loves to ask questions about how commonplace items, many taken for granted today, came into being.

# Steven Caney's Ultimate Building Book

**Including More Than 100 Incredible Projects Kids Can Make!**

**Steven Caney, Lauren House (Illustrator)**

Publisher: Perseus Publishing

Pub. Date: October 2005

ISBN-13: 9780762404094

Age Range: 8 to 12

608pp

Packed with exciting building projects guaranteed to engage anyone from age 4 to 104, the Ultimate Building Book gives easy-to-follow instructions for creating amazing models and toys that are as much fun to make as they are to play with! Readers are also introduced to a wide variety of household materials and tools that can be used for building, along with fascinating insights into the architectural and design properties of everything from drinking straws to yurts.

## Website Selections

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### Inventors and Inventions

Cybersleuth inventor profiles/biography index

<http://cybersleuth-kids.com/sleuth/Science/Inventors/index.htm>

Inventor biographies, quotes, photographs and resources

[http://www.ideafinder.com/history/of\\_inventors.htm](http://www.ideafinder.com/history/of_inventors.htm)

Museum of Science's Leonardo's Workshop with interactives for students and classroom activities for teachers

<http://www.mos.org/sln/Leonardo/InventorsWorkshop.html>

### Probability

A Better Fire interactive probability game with student and classroom pages

[http://www.shodor.org/interactivate/activities/ABetterFire/?version=1.6.0\\_07&browser=MSIE&vendor=Sun\\_Microsystems\\_Inc](http://www.shodor.org/interactivate/activities/ABetterFire/?version=1.6.0_07&browser=MSIE&vendor=Sun_Microsystems_Inc)

A "choose the door" Monty Hall style interactive probability game with student and classroom pages.

<http://www.shodor.org/interactivate/activities/SimpleMontyHall/>

Techteacher's probability lesson plans/activities index page

<http://www.techteachers.com/mathweb/probability.htm>

### Light, Lens, Microscopes

Arizona State University's Patterns in Nature light module

<http://accept.la.asu.edu/PiN/mod/light/pattLightOptics.html>

View live cells in images and movies

<http://www.cellsalive.com/>

## Physics Principles/Activities

Wake Forest University's on-line fun physics demo index page.

<http://www.wfu.edu/physics/demolabs/demos/avimov/byalpha/abvideos.html>

How Stuff Works physics activities for kids

<http://home.howstuffworks.com/fun-physics-activities-for-kids.htm>

Explore Learning's inactive physics simulations

<http://www.explorescience.com/>