

## Teacher Guide to Simple Machines in the Museum

Grades 2 - 4

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This guide can help you to link together several learning experiences in order to create a focused field trip for your students. These suggestions, exhibits, and programs are each described in order to help you plan.

### **Suggested Introductory Activity** (5 - 15 minutes)

Visit the ***Archimedean Excogitation Audiokinetic Sculpture***, Green Wing, Lower Level, as a warm up to identifying simple machines within complicated systems. Refer to the **Simple Machine Tic-Tac-Toe** student worksheet or your own curriculum-based list of simple machines and ask students to look for, discuss, and/or draw examples of simple machines.

### **Archimedean Excogitation Audiokinetic Sculpture**

This is one of many rolling ball sculptures created by George Rhoads for museums, science centers, and malls around the country. This 27-foot-tall machine illustrates the relationship between potential and kinetic energy. Energy harnessed from gravity and stored in motors and springs sends balls, gears, paddles, and pulleys whirling in an exciting display of motion.



**Artist:** George Rhoads

**Website:** [Rock Stream Studio](http://www.rockstreamstudio.com)

## **Suggested Look, Think, and Build Activity**

(30 - 45 minutes)

Conduct the **Modeling Simple Machines** activity (*next page*) at the **Clark Collection of Mechanical Models**, Blue Wing, Lower Level.

### **The Clark Collection of Mechanical Movement Models**

This set of working models was designed by American engineer William M. Clark in the early 1900s. Originally numbering over 200, these models were displayed as the Mechanical Wonderland in New York in 1928 and at the Century of Progress Exhibition in Chicago in 1933. Today, 120 of these mechanical models remain in working order and on display at the Museum.

Based in large measure on designs laid out in Henry T. Brown's *Five Hundred and Seven Mechanical Movements* (1871), the Clark models include gear mechanisms, pulley systems, cutaways, and cross sections of a variety of machines. They illustrate methods of converting rotary to rectilinear motion and rectilinear to oscillating motion, as well as solutions to a variety of mechanical tasks. The models remain of interest today to a range of visitors, from young children to mechanical designers and tinkerers.

**Author:** William M. Clark

**Source/Publisher:** New York Museum of Science

**Website:** [Kinematic Models for Design Digital Library](#)



# Modeling Simple Machines at the Museum

The *Clark Collection of Mechanical Movement Models*

(Often called the *Gear Models*)

Blue Wing, Lower Level, at the bottom of the escalators.

Provide the chaperone with one bag of student materials for each student as well as a chaperone tool kit. Ideally, a classroom teacher or science specialist, using the same simple machine vocabulary that is used in the classroom, takes the role of activity leader to welcome, focus, and support small groups of students and chaperones as they complete the hands-on part of this activity.

1. Review the simple machines vocabulary from your classroom with the students.
2. Have students view the models. Cases are against the escalator, along the outer wall and near the restrooms.
3. Hand out materials and ask students to construct something that **looks like or works like** a simple machine.

Extensions:

- Provide a “trade box” allowing students to exchange any item in their bag with another item, to encourage creativity.
- Back at school, have students “name” their construction and write a story about it.

## **Sample Student Materials Bag**

Prepared by teacher prior to trip:

One large zip bag per student with the following 12 items:  
2 wooden spools, 7/8 x 1-1/8 x 9/32 inches on hole (*Several sources can be found online.*)  
1 jumbo craft stick, 6 x 3/4 inches  
1 stem: 12-inch Jumbo stem or pipe cleaner  
1 piece of string: 18 – 24 inches of cotton string, 10 ply  
2 index cards, 4 x 6 inches  
2 paper clips, 1 large and 1 small  
2 rubber bands, assorted  
1 drinking straw, unwrapped

## **Sample Chaperone Tool Kit**

(per ~5 students)

Prepared by teacher prior to trip:

Masking tape  
2 – 3 student scissors  
Marker or pen with which *adults* write names on bags  
Hole punch  
Ruler

## **Sample Trade Box Items**

Various-size wooden spools  
Assorted paper and plastic cups (include paper cones if you can!)  
Cardboard circles or wheels

Additional string, paperclips, stems, rubber bands, etc.

## **Suggested Thematic Hunt(30 - 45 minutes)**

Hand out the **Simple Machine Tic-Tac-Toe Student Worksheet** and golf pencils so that students, in their chaperoned groups, can record what they find as they search for simple machines through the Blue Wing of the Museum. Be sure to stop at the ***Science in the Park*** and ***Investigate!*** exhibits, Blue Wing, Level 2.

### **Investigate! - A See-for-Yourself Exhibit**

This science activity center focuses on experimentation -- challenging visitors to ask questions, formulate hypotheses, develop and conduct experiments, draw conclusions, and share their results with other visitors to the exhibit. Visitors can explore many open-ended activities in the solar car workshop, water activity area, archaeological dig site, and gravity and balance area.

### **Science In The Park**

How do the universal laws of forces and motion affect our daily lives? In this exhibit, visitors are encouraged to participate in various physical activities in an outdoor park-like environment. Visitors can experiment with objects in motion, make observations of velocity and acceleration, and draw conclusions and share the results with others.

## **Challenge**

Can your students find a simple machine in the ***New England Habitats*** exhibit?  
(Green Wing, Level 1)



## Simple Machine Tic-Tac-Toe

**gear**

**lever**

**screw**

**wedge**

**wheel &  
axle**

**gear**

**incline  
plane**

**pully**

**wheel &  
axle**

## **Primary Standard Connections**

### **ITEA Standards For Technological Literacy (2000)**

#### **The Designed World > 16.D. Energy and power technologies** (Grade: 3 - 5)

Tools, machines, products, and systems use energy in order to do work.

### **MA Science and Technology/Engineering Framework (2001)**

#### **Technology/Engineering > 1. Materials and Tools**

(Grade: 3 - 5)

Broad Concept: Appropriate materials, tools, and machines extend our ability to solve problems and invent.

#### **Technology/Engineering > 1.3. Materials and Tools**

(Grade: 3 - 5)

Identify and explain the difference between simple and complex machines, e.g., hand can opener that includes multiple gears, wheel, wedge gear, and lever.

#### **Technology/Engineering > 2.1. Engineering Design**

(Grade: K - 2)

Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever.

## **Secondary Standard Connections**

### **ITEA Standards For Technological Literacy (2000)**

#### **The Nature of Technology > 02.K. Core concepts of technology**

(Grade: 3 - 5)

Tools and machines extend human capabilities, such as holding, lifting, carrying, fastening, separating, and computing.

### **MA Science and Technology/Engineering Framework (2001)**

#### **Physical Sciences (Chemistry and Physics) > 4. Position and Motion of Objects**

(Grade: K - 2)

Demonstrate that the way to change the motion of an object is to apply a force (give it a push or a pull). The greater the force, the greater the change in the motion of the object.

### **National Science Education Standards (1996)**

#### **Physical Science > Position and motion of objects**

(Grade: K - 4)

The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.