

*Discovering the Story: A City and Its Culture*

*Changing  
Silver*



A Science Lesson  
for Grades 4-8  
based on Vase  
and Dedication  
Medallion by  
Tiffany & Co.

Tiffany & Co. (1853-) Vase and Dedication Medallion, 1878  
Silver  
Bequest of Reuben R. Springer 1884.483

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## CONCEPT

Teachers will guide the students through detailed scientific observations of physical properties by examining the appearance of the sterling silver vase artifact. Students will learn about the scientific method and will explore chemical reactions employing silver and common household products. This activity allows students to use the scientific method to examine and identify a set of (nontoxic) substances that, through a chemical reaction (acid or base), removes tarnish from silver.

## OBJECTIVES

- Students will understand that the *Vase and Dedication Medallion* is a metal object with both distinct physical and chemical properties.
- Students will identify the physical properties of silver through observation and guided discussions.
- Students will gain scientific understanding of tarnish or oxidation that results from the contact of specific elements with silver.
- Students will experiment, analyze and evaluate observational data concerning the effective use of common household materials to remove tarnish or oxidation.

*"For the future of our children and our communities, we must find new ways to engage students in the learning process. The arts can be a powerful vehicle through which to challenge young people's minds, stir their creativity, instill discipline and build self-esteem."*

Lawrence A. Hough  
President and Chief Executive Officer  
Sallie Mae

## Teacher Preparation

### CLASS PERIODS REQUIRED

- 1 (50 min.) class period for Pre-Lesson Activities
- 1 50-min. class period for Videoconference
- 2-3 class periods for introduction of Post-Lesson Activities

### BACKGROUND INFORMATION

Refer to Background Information for more on Reuben Springer and the Museum's *Vase and Dedication Medallion* and the company that created them. Background Information is on the website at <http://www.discoveringthestory.org/goldenage/springer/background.asp> and has been written for teachers to review before the lesson and then share with students.

### VIDEO

Share the *Vase and Dedication Medallion* video with your students prior to the videoconference. The video, on the website at <http://www.discoveringthestory.org/goldenage/springer/video.asp>, is an interview with a Museum curator on Reuben Springer and the *Vase and Dedication Medallion*. This video is an excellent resource that will help to prepare students for the videoconference. Video Duration – five minutes.

*"We live in an age increasingly ruled by science and technology, a fact that only underscores the need for more emphasis on the arts . . . A grounding in the arts will help our children see; to bring a uniquely human perspective to science and technology. In short, it will help them as they grow smarter to also grow wiser."*

Robert E. Allen  
former Chairman and Chief Executive  
Officer, AT&T Corporation

## Pre- Videoconference

### VOCABULARY

Definitions can be found in the Glossary on the *Discovering the Story* website at <http://www.discoveringthestory.org/goldenage/springer/glossary.asp>.

Corrosion  
Ductile  
Luster  
Malleable  
Silver  
Tarnish

### GUIDING QUESTIONS

- Does metal change over time or does it always look the same?
- The Museum's *Vase and Dedication Medallion* were given to Rueben Springer in the late nineteenth century. How do you think it has changed over the years?
- Why do you think the Museum has a glass case over the *Vase and Dedication Medallion*? What do you think is inside the case besides the vase?
- Would a silversmith like the one who made this vase and medallion need to know about science when he or she is working with silver to create a metal artwork?

### MATERIALS

- Print reproductions of the Museum's *Vase and Dedication Medallion*, which can be found at [http://www.discoveringthestory.org/goldenage/springer/images/springer\\_full.jpg](http://www.discoveringthestory.org/goldenage/springer/images/springer_full.jpg)
- Pencils
- Group Observation Handout (handout can be found at the end of the lesson)

### PROCEDURE

Teacher will:

- Ask students to look at the *Vase and Dedication Medallion* and examine the beauty of each sterling silver artifact. Explain to students that these items were made in the late nineteenth century, however they still look as they did when presented to Rueben Springer.
- Ask students if metals always look the same or if they change over time. Have them think about outdoor statues or old coins as examples.
- Discuss what tarnish is (corrosion) and how it occurs.

- Have students watch and listen to the video and record words that explain what the surface of the silver vase looks like.
- Have students list words that identify the brightness, shininess or dullness on the vase. After the students have recorded descriptive information on the appearance of the vase, their notes will serve as the foundation for their silver-cleaning experiment.
- Have students, as a class, create a list of questions regarding the Museum's *Vase and Dedication Medallion*, the patron of the arts Reuben Springer and/or the historical period. Email these questions to the Museum in advance of the videoconference.

*Without the arts, education is not education but vocational training...Practicing one's profession successfully calls for skills in dealing with people, for being able to comprehend the connection between cause and effect, and the ability to carry the burdens placed on the individual in a free society. The arts help to prepare the human mind for such needs.*

Norman Cousins  
Former Editor, *The Saturday Review*  
Author of numerous books  
1987

## Videoconference

### OBJECTIVES

- Students will interact with the Cincinnati Art Museum staff through a sixty-minute videoconference. Information on the videoconference can be found at <http://www.discoveringthestory.org/videoconference/>.
- Students will learn about Cincinnati history from 1850 to 1900.
- Students will use Museum objects to reinforce activities completed in preparation for this videoconference.

### CONCEPT

A videoconference conducted by the Cincinnati Art Museum staff extends student learning through emphasis on the viewing and discussion of art objects. During this videoconference with the Museum, students will explore Cincinnati art history and the methods and practices of many of the artists working in the city.

### SCHEDULE

- **5 minutes** Introduction to CAM staff (*This is also buffer time in case of connection complications*)
- **10 minutes** Brief discussion of student pre-videoconferencing activities.
- **10 minutes** Museum staff will lead an interactive discussion with students on the history of Cincinnati from 1850-1900
- **20 minutes** Museum staff will lead students in an in-depth investigation of selected Museum objects.

### Objects Include

- *Bedstead* by Benn Pitman, Adelaide Nourse Pitman, and Elizabeth Nourse. [http://www.discoveringthestory.org/goldenage/images/bedstead\\_full.jpg](http://www.discoveringthestory.org/goldenage/images/bedstead_full.jpg)
- *Reception Dress* by Selina Cadwallader. This image can be found at [http://www.discoveringthestory.org/goldenage/images/dress\\_full.jpg](http://www.discoveringthestory.org/goldenage/images/dress_full.jpg)
- *Aladdin Vase* by Maria Longworth Nichols Storer, which is available at [http://www.discoveringthestory.org/goldenage/images/aladdin\\_full.jpg](http://www.discoveringthestory.org/goldenage/images/aladdin_full.jpg)
- *Ali Baba Vase* by M. Louise McLaughlin, which is available at [http://www.discoveringthestory.org/goldenage/images/alibaba\\_full.jpg](http://www.discoveringthestory.org/goldenage/images/alibaba_full.jpg)
- *Vase and Dedication Medallion* by Tiffany & Co. This image is on the Website at

[http://www.discoveringthistory.org/goldenage/images/springer\\_full.jpg](http://www.discoveringthistory.org/goldenage/images/springer_full.jpg)

- **10 minutes** Questions and student sharing of art projects.
- **5 minutes** Closing (*This is also buffer time in case of connection complications*)

## POST – VIDEOCONFERENCE

### MATERIALS

- Periodic table of elements
- Group Observation Handout (one per group) (handout is at end of lesson)
- One piece of very tarnished silver per group (suggestions for locating old silver items: found objects brought in from home, parent donations, thrift stores)
- Home Recipe Test Sheet (one per student) (sheet is at end of lesson)
- Soft cloth for cleaning/shining silver (one per group)

### PROCEDURE

Teacher will:

- Have students collaborate in groups, recording the effectiveness of home remedies that remove silver tarnish.
- Provide each student group with the Group Observation Handout and a piece of tarnished silver.
- Discuss with the students the physical and chemical properties of metals. First have them record the physical properties: What do they see? What conclusions can be drawn from these observations?
- Ask students what they think of when they hear the word metal. Explain that although they probably think of silver, iron or copper, there are other elements that are classified as metals that they may not think of as metals, such as calcium, sodium and potassium.
- Explain that of the 109 known elements, most are metals. In looking at the periodic table, students will see a dark zigzag line running like steps down the right side. The 88 elements to the left of this line are metals or metal-like elements.
  - Discuss with the students how they will learn about the chemical properties of metals. Inform each group that this is a collaborative experiment and the group should select a recorder to document or write the collected data information on the sheet.
  - Assign each group a home remedy for removing tarnish.
  - Have students make a prediction about what will happen based on their knowledge of metals and these chemicals. How effective will this be?
  - Have each group record the exact procedure for removing the tarnish.
  - Record observations. Have students complete Home Recipe Test Sheet individually.
  - **Discussion Questions:**



- Avoid overexposure of foods such as eggs, mayonnaise and mustard. WHY? Answer: These are high in sulfur and can cause the silver to corrode. Keep your silver away from all rubber items, which contain sulfur. Be careful to remove all the silver polish from the objects, as it will leave a nasty taste. Do not wear latex gloves when handling, cleaning or polishing silver. Silver-coated or silver-plated items may wear down with frequent polishing. Avoid polishing with a silver polish more than once or twice a year. If washed and dried properly and used frequently, tarnish should not become a problem.
- White chalkboard chalk placed in the storage area with your silver can help prevent tarnish. Why?
- Avoid placing silver flatware in the same container as stainless steel flatware. Contact of the two different metals can cause the silver to become damaged and stained. Why?
- Remember: Using silver prevents tarnish. The more you handle it, the less chance of tarnish buildup. Why?

## ASSESSMENT OBJECTIVES

- Students explain that there are differing sets of procedures for guiding scientific investigations and that procedures are determined by the nature of the investigation, safety considerations and appropriate tools.
- Students organize and evaluate observations, measurements and other data to formulate inferences and conclusions.
- Students use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation.

*Arts programs give young people the chance to take risks, be creative and learn self-discipline, and build critical self-esteem. In Indianapolis, we are currently working to ensure that our young people have fewer opportunities to spend their time with violent and sexually explicit video games. The arts, on the other hand, can be an excellent way to build communication skills and to learn how to release emotions in positive, non-destructive ways. Through the arts, young people learn not only skills for a lifetime, but they can also explore exciting new worlds.*

Mayor Bart Peterson  
Indianapolis

## ACADEMIC CONTENT STANDARDS

### NATIONAL STANDARDS: SCIENCE

**Standard 12:** Understands the nature of scientific inquiry.

**Grades 3–5**

**Benchmark 3:** Plans and conducts simple investigations.

**Benchmark 4:** Uses appropriate tools and simple equipment to gather scientific data and extend the senses.

**Grades 6–8**

**Benchmark 3:** Designs and conducts a scientific investigation.

**Benchmark 7:** Knows that scientific inquiry includes evaluating results of scientific investigations, experiments, observations, theoretical and mathematical models, and explanations proposed by other scientists.

### OHIO STANDARDS: SCIENCE

**Physical Sciences:** Students demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world. This includes demonstrating an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter. In addition, it includes understanding the nature, transfer and conservation of energy; motion and the forces affecting motion; and the nature of waves and interactions of matter and energy. Students demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

**Grades 3–5**

**Benchmark A:** Compares the characteristics of simple physical and chemical changes.

**Scientific Inquiry:** Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions and to gather and analyze information. They understand how to develop hypotheses and make predictions. They are able to reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

**Grades 3–5**

**Benchmark A:** Uses appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation.

**Benchmark B:** Organizes and evaluates observations, measurements and other data to formulate inferences and conclusions.

**Benchmark C:** Develops, designs and safely conducts scientific investigations and communicates the results.

**Grades 6–8**

**Benchmark A:** Explains that there are differing sets of procedures for guiding scientific investigations and that procedures are determined by the nature of the investigation, safety considerations and appropriate tools.

**Benchmark B:** Analyzes and interprets data from scientific investigations using appropriate mathematical skills to draw valid conclusions.

## Group Observation Handout

### I SPY

Name of Team \_\_\_\_\_ Grade \_\_\_\_\_ Room \_\_\_\_\_

Student Names \_\_\_\_\_

\_\_\_\_\_

#### Directions:

Please review your notes from the Cincinnati Art Museum's post-videoconference discussion.

Read all of the words that you used to describe the appearance of the *Vase and Dedication Medallion*. Record those words on the line below.

*Vase and Dedication Medallion*

Observation Words:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

Examine the piece of silver that you now have.

What silver object do you have? \_\_\_\_\_

Record words that describe the appearance of this piece of silver.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

## Compare and Contrast

### *Vase and Dedication Medallion* vs Piece of Silver that Was Given to Me

Write a few sentences comparing the appearance of the *Vase and Dedication Medallion* to the piece of silver that was provided for you.

What are the differences between the two pieces of silver?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Record your observations in the space below:

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### Extra Credit Response:

If you were awarded a metal for something fantastic that you did, what would you receive a metal for?

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What would your metal look like? Would you like it to look like this one or different? Please describe. \_\_\_\_\_

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Draw what your metal would look like.

## Home Recipe Test Sheet

Name of Team \_\_\_\_\_ Grade \_\_\_\_\_ Room \_\_\_\_\_

Student Names \_\_\_\_\_

### Directions:

1. Each group should look closely at your silver test item.
2. The condition of your silver item should be gray, faded or tarnished and not shiny. Please remember the words that you used to describe the vase. The words that we just used have the opposite meaning.
3. You will now need to use a soft cloth to test your assigned home recipe. You will need to record your findings and draw conclusions. Please work together as a group.

Record your tarnished observations.


List home recipe chemicals used: \_\_\_\_\_

Record your process:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Describe the effectiveness:

\_\_\_\_\_

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Draw a conclusion on why the cleaner did or did not work well:

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Place your results on the lab table and prepare for sharing your findings with the class.

### **YOURS VS. The OTHERS—How Do You Shine?**

Look at all of the silver pieces that have been cleaned. How does yours rank?  
Place in order from the most effective to the least effective silver cleaner.

\_\_\_\_\_ Baking Soda Silver Cleaner

\_\_\_\_\_ Olive Oil Silver Cleaner

\_\_\_\_\_ Milk Silver Cleaner

Why did the most effective one work best?

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Why did the least effective one work worst?

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## HOUSEHOLD RECIPES FOR SILVER POLISH

### Baking Soda Silver Cleaner

2 tablespoons salt

2 tablespoons baking soda

Mix and add the mixture to a sink full of steaming, hot water. Put a sheet of aluminum foil in the bottom of the sink. Dip the silver objects into the sink, making sure the silver rests on the aluminum foil. You should be able to see the tarnish disappear. For heavily tarnished silver pieces, you may need to leave it in the solution for five minutes. Rinse the silver and dry thoroughly.

### Olive Oil Silver Cleaner

2 tablespoons whiting

Sweet oil or olive oil

Mix whiting with oil. Apply to silver and allow to dry. Rub off with a soft cloth. Polish with a soft cloth.

### Milk Silver Cleaner

1 cup whole milk

2 teaspoons cream of tartar or 1 tablespoon white vinegar or lemon juice

Mix. Soak tarnished silver overnight. Rinse with cold water, then polish dry.

### SHINY SILVER: Tips and Tricks

Simple do-it-yourself instructions provided for cleaning and polishing silver, including a homemade silver dip and tricks for safe storage. Is my addition of “and” here correct?

Nothing is prettier than a silver tea set, but a tarnished silver tea set leaves a lot to be desired. To keep your silver looking its finest, here are a few tips and techniques to follow.

- Silver should be washed and dried by hand; it is definitely not a dishwasher-friendly item.
- Do not leave silver on a rubber mat to dry, as rubber contains sulfur that can cause corrosion on the silver.
- It is important to use a soft cloth when drying the silver to prevent scratching. If it has 47 neutrons, making it quite heavy, why is it so easy to scratch?
- With frequent use, your silver should stay tarnish free; however, everyone is faced with occasional polishing. Apply the silver polish according to the manufacturer’s directions. Be sure to rub the polish in thoroughly. With a dry polishing cloth, buff the surface of the polished silver to a bright sheen. What causes the bright sheen?
- When storing silver, it is necessary to pretreat the silver with a tarnish-retardant polish. Wrap the silver carefully in two layers of plastic wrap to keep it air free. What does the air do? (Answer: This will keep the silver airtight and prevent oxidation, which causes silver to tarnish.)
- Store your silver objects on a piece of lacquered or polyurethane wood. Add desiccated silica gel and a few capsules or small dish or activated charcoal to the storage area to help keep down humidity levels and keep the area free of gases known to cause tarnish. A few capsules of what or a small dish of what?

Remove corrosion caused by salt or food by placing the silver object in a mixture of two cups of hot vinegar to one tablespoon of salt. Allow the silver to soak for up to five minutes, rinse and dry well.