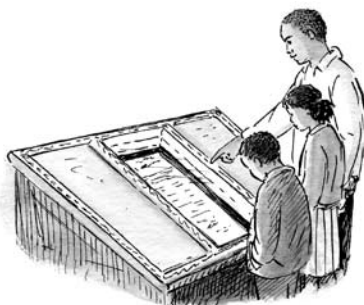


Saving the National Treasures

PROGRAM OVERVIEW

NOVA traces the history of the nation's Charters of Freedom—the Constitution, the Bill of Rights, and the Declaration of Independence—and documents the five-year, \$5 million design and construction of the new encasements that will house them.



The program:

- reports on how the original sealed glass cases were constructed in the early 1950s and expected to last indefinitely.
- notes that only 50 years later conservators began questioning the condition of the original housing when microscopic analysis revealed deterioration of the glass.
- reviews the team of physicists, chemists, engineers, and conservators who were assembled to determine the best type of new encasements.
- recounts how the Declaration of Independence came to be made and details its contents and travels during the Revolutionary War.
- relates how parchment is made from animal skin and how ultraviolet rays, oxygen, and fluctuations in humidity can adversely affect it.
- details each part of the new encasement prototype and reports on controversies that arose during its design.
- explains that the original document may have been subjected to water when an engraving was made of it and to sun exposure when it resided at the former Patent Office.
- reviews how the document's iron gall ink was made.
- details how the Declaration of Independence, a document written as a declaration of war against England, evolved during its 200-year history into a ringing declaration of equality for all.
- features the removal of the documents from their original cases and notes the three-year process in which the documents were examined and photographed.
- notes that conservators performed limited and reversible restoration to the documents prior to their re-encasement and display at the National Archives Building in Washington, D.C.

Taping Rights: Can be used up to one year after the program is taped off the air.

BEFORE WATCHING

- 1 Ask students what they think an artifact is. (It is an object made by a human.) Ask students to describe the personal artifacts they save. Why are the artifacts important? What do students do, if anything, to preserve their artifacts?
- 2 Ask students to name the country's important founding documents. Ask students what it is about these documents that make them important. When were they written? By whom? What does each document declare? (See Activity Answer on page 4 for more information.)
- 3 Organize students into two groups. Have one group take notes on the design and fabrication of the encasements made for the Charters of Freedom. Have the other group take notes on the Declaration of Independence and how its meaning has changed over time.

AFTER WATCHING

- 1 Lead a discussion about the encasement design chosen to house the Charters of Freedom. What does it protect the documents from? (Examples include oxygen exposure, and light damage.) Have students name some design features. (It has a highly polished frame to ensure airtight seal, and a clear colorless glass to aid viewing.) Discuss how the meaning of the Declaration of Independence has changed since 1776. What part of the document was most important to the founding fathers? What part of the document is important today?
- 2 Experts spent five years and \$5 million to design and build the new encasements. Why are these documents important to U.S. citizens? Why is it important that they should be preserved? Why is it important that they be available to the public?

CLASSROOM ACTIVITY

Objective

To determine the efficacy of different preservation techniques to reduce fading or yellowing from sun exposure.

Materials for each team

- copy of the “Preserving Paper” student handout
- copy of the “Sample Charts” student handout
- white paper
- scissors
- tape
- pen or pencil
- plastic safety goggles
- 4 sheets of non-fade-resistant construction paper—1 yellow, 1 blue, 1 red, 1 green (for colored paper teams only)
- newspaper
- materials for four treatment methods as determined by the class (see some suggestions below)

Procedure

- 1 Prior to doing the activity, leave a newspaper out in the sun until it yellows. Begin the activity by showing students the yellowed newspaper with a fresh newspaper. Ask students why they think one paper has yellowed. If some students speculate sun exposure explain that it is the ultraviolet rays from the sun that cause the damage. Tell students that in this activity, they will be experimenting with the efficacy of different preservation techniques to reduce fading or yellowing on paper samples exposed to the sun.
- 2 Brainstorm with students six to eight possible treatment methods to protect colored paper and newspaper from sun damage. (Keep in mind that experiments will hang in school windows, so treatments should be able to dry and not harm windows.) Some suggestions include clear plastic covering, light-colored plastic covering, pump hair spray, wax, glue, paper cement.
- 3 Organize students into teams. As a class, choose four of the treatment methods to test. Ask half the class to test the treatment methods on newspaper samples and half the class to test their treatment methods on colored paper samples.
- 4 Distribute the activity handouts and a set of materials to each team. Review activity instructions with students. Have students prepare their samples. Remind students that any materials that receive coatings should be entirely covered but not dripping wet and that safety goggles should be worn when using any spray materials or products that could be harmful to the eyes. Have students clean their hands thoroughly after applying the treatments. Ask students to label and date each test sample.

STANDARDS CONNECTION

The “Preserving Paper” activity aligns with the following National Science Education Standards.

GRADES 5–8

Science Standard B:

Physical Science

Transfer of energy

- Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).

GRADES 9–12

Science Standard B:

Physical Science

Chemical reactions

- Chemical reactions may release or consume energy. Some reactions such as the burning of fossil fuels release large amounts of energy by losing heat and by emitting light. Light can initiate many chemical reactions such as photosynthesis and the evolution of urban smog.

*Video is not required
for this activity.*

Classroom Activity Author

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CLASSROOM ACTIVITY (CONT.)

- 5 Tape the dried displays to the window (facing the sun) and note the time and day they are posted. Students should also note whether their group's samples receive the most, somewhere in the middle, or the least amount of daily sunlight relative to other teams' displays. Have students leave samples in the window for a period of seven days. (You may want to extend this period of time depending on the amount of sunlight the samples get during the experiment.) It is important for students to check their experiment each day they are at school because a treatment may protect the paper for a limited amount of time.
- 6 Have students make a prediction about the treatment they believe will be most effective in preserving color or in keeping the newsprint from yellowing. Ask them to write down their prediction and why they made their choice.
- 7 Ask students to observe the window displays each day and record their observations in their journal. Students should record the date and about how many hours of sunlight the displays receive each day. At the end of the experiment, have students gather their samples.
- 8 Ask students to compare their light-exposed control to the dark control and record any differences. They should then compare treated samples with the light-exposed control and note the effects of the sunlight. They should also describe any damage caused by the different treatment methods on the colored paper or the newspaper.
- 9 Have a class discussion and ask teams to share their results. Which color of paper was best preserved? By which technique? Which image had the least fading, yellowing, and/or damage? How did actual results concerning the best-preserved image match students' predictions? (See Activity Answer on page 4 for sample results using some of the materials mentioned above.)
- 10 As an extension, have students experiment with different inks. You may want to have students make iron gall ink (substitute tannic acid if you cannot get wasp galls) and compare its durability to commercial black ink by wetting the paper or subjecting it to moderate heat.

ACTIVITY ANSWER

Thomas Jefferson first composed the Declaration of Independence in June 1776. The Declaration proclaimed the separation of the thirteen colonies from Great Britain and established the United States of America. An extended list of charges against the King detailed the reasons for the separation. On July 4, 1776, Congress formally adopted the Declaration; on August 2, Congress began to sign the final parchment, a process that took more than a year.

The Articles of Confederation were the first iteration of the country's constitution. Composed during the Revolutionary War, they were enacted March 1, 1781. Six years later, the states revised the Articles and drafted the current version of the U.S. Constitution. Since that time, the Constitution has been amended 27 times. It holds the record as the longest-lasting written constitution in the world. The Bill of Rights was added to the Constitution as the first ten amendments on December 15, 1791.

Sample Results

In this activity, colored paper and newspaper samples were exposed to sunlight. Sample results were obtained using wax, pump hair spray, water-based glue, paper cement, and plastic wrap. The experiment was done in November and December at a latitude of 42 degrees North. The materials received about 15 hours of afternoon sun. Results will vary depending upon latitude and season. Although scientists don't know exactly what causes newsprint paper made of groundwood pulp to yellow, one 1991 study confirms that solar UV radiation is the cause.

Colored Paper: In comparison to the dark control, the light-exposed control was noticeably faded after three to four days, or after about eight hours of sun. After seven days, the order of fading from least faded to most faded was—paper cement treated, hair spray treated, plastic wrap treated, wax treated, light control, glue treated. The treatments didn't appear to significantly alter the colored paper, although the glue may have lightened it.

Newspaper: In comparison to the dark control, the light-exposed control was slightly yellowed after two to three days, or after about seven hours of sun. After seven days, the order of yellowing of the newspaper from least yellowed to most yellowed was—paper cement treated, hairspray treated,

plastic wrap treated, wax treated, light control, glue treated. Some of the treatments altered the print or paper. Glue wrinkled the paper, wax blurred the print, and paper cement darkened the paper.

Major funding for NOVA is provided by Google and BP. Additional funding is provided by the Howard Hughes Medical Institute, the Corporation for Public Broadcasting, and public television viewers.



LINKS AND BOOKS

Links

NOVA Web Site—Saving the National Treasures
www.pbs.org/nova/charters/
Find an article, interview, interactive activities, and resources in this companion Web site to the program.

Charters of Freedom
www.archives.gov/national_archives_experience/charters/charters.html
Presents high-resolution images of the Charters of Freedom and supplies additional information about the making and impact of the Charters.

Charters of Freedom Project
www.nist.gov/public_affairs/Charter/charters_of_freedom_project.htm
Provides information about the new encasements being made by the National Institutes of Standards and Technology.

Preserving the Charters of Freedom
www.memomagazine.org/backissues/mar03/departments/input_output/input_out.html
Shares the role that some scientists played in helping to protect the Charters.

Preserving Works on Paper: Manuscripts, Drawings, Prints, Posters, Maps, Documents
www.loc.gov/preserv/care/paper.html
Explains factors critical to preserving paper collections.

Books

Maier, Pauline.
American Scripture: Making of the Declaration of Independence.
New York: Knopf, 1997.
Presents the story of the drafting of the Declaration, the political atmosphere in which it was composed, and how it has been redefined and used by different groups of Americans.

Marcovitz, Hal.
The Declaration of Independence.
New York: Mason Crest Publishers, 2002.
Discusses the creation of the Declaration of Independence and the document's importance in American history.

Preserving Paper

The Declaration of Independence, the Bill of Rights, and the Constitution have been on display for well over 150 years. Now a new case has been constructed to preserve these important symbols of democracy. In this activity, you will experiment with different ways of preserving documents from sunlight damage.

Procedure

- 1 Use the examples on the “Sample Charts” handout to make a chart in your journal that lists your treatment methods. Predict which of your preservation techniques will best prevent fading of (or yellowing) and damage to whichever paper you have been assigned (colored paper or newspaper clippings). Record your prediction and reasons in your journal.
- 2 Work with your team to prepare the four samples and two controls. Place newspaper over your workspace. Cut six 2 cm x 2 cm pieces of each color of construction paper or 8 cm x 8 cm newspaper depending upon which kind of paper your team is testing. (If you are using colored paper, make sure your samples are in the same location and same order on each sample.)
- 3 Label the four treatment samples. Label one control “light-exposed control” and one “dark control.”
- 4 Put on your goggles. Cover the four samples—each with a different treatment. Use a thin layer of treatment. Allow samples to dry entirely before attaching them to white background paper.
- 5 Tape the labeled samples and the “light-exposed control” onto white background paper. Keep the pieces in a vertical line and make sure they are not touching one another.
- 6 Place the “dark control” in an envelope or a dark place such as a drawer. Tape your samples to the window (image facing out) so that, if possible, they all receive about the same amount of sunlight each day. Note in your journal if there are differences in the amount of sunlight each receives. Leave the samples there for seven days. Check them daily and record your observations in your chart.



- 7 At the end of seven days, carefully gather your samples and your controls. As a team, compare your samples, discuss your results, and share your findings with the class.

Questions

Write your answers on a separate sheet of paper.

- 1 Analyze your data chart and your samples. Reexamine the two controls. Compare the dark control to the sunlight-exposed control. Note any fading (colored paper) or yellowing (newspaper) differences. Compare the sunlight-exposed control to the treated samples. What, if any, differences do you see? Rank each treatment method in order of how well it prevented the colored paper from fading or the newspaper from yellowing.
- 2 Describe the effect sunlight had on materials.
- 3 Describe any damage caused by the different treatment methods on the colored paper or the newspaper.
- 4 Compare your predictions to the results. How accurate were your predictions?
- 5 Which of your treatment methods was most effective in preserving the sample and preventing fading or yellowing? Why do you think it worked? If one or more treatment methods did not work to prevent fading, why do you think it/they did not work?

Sample Charts

Colored Paper Chart

Date						
Hours of Sun						
Light Control bright yellow deep red royal blue bright green						
Dark Control list all four colors						
Treatment method list all four colors						
Treatment method list all four colors						
Treatment method list all four colors						
Treatment method list all four colors						

Newspaper Clipping Chart

Date						
Hours of Sun						
Light Control newspaper clipping						
Dark Control newspaper clipping						
Treatment method newspaper clipping						
Treatment method newspaper clipping						
Treatment method newspaper clipping						
Treatment method newspaper clipping						