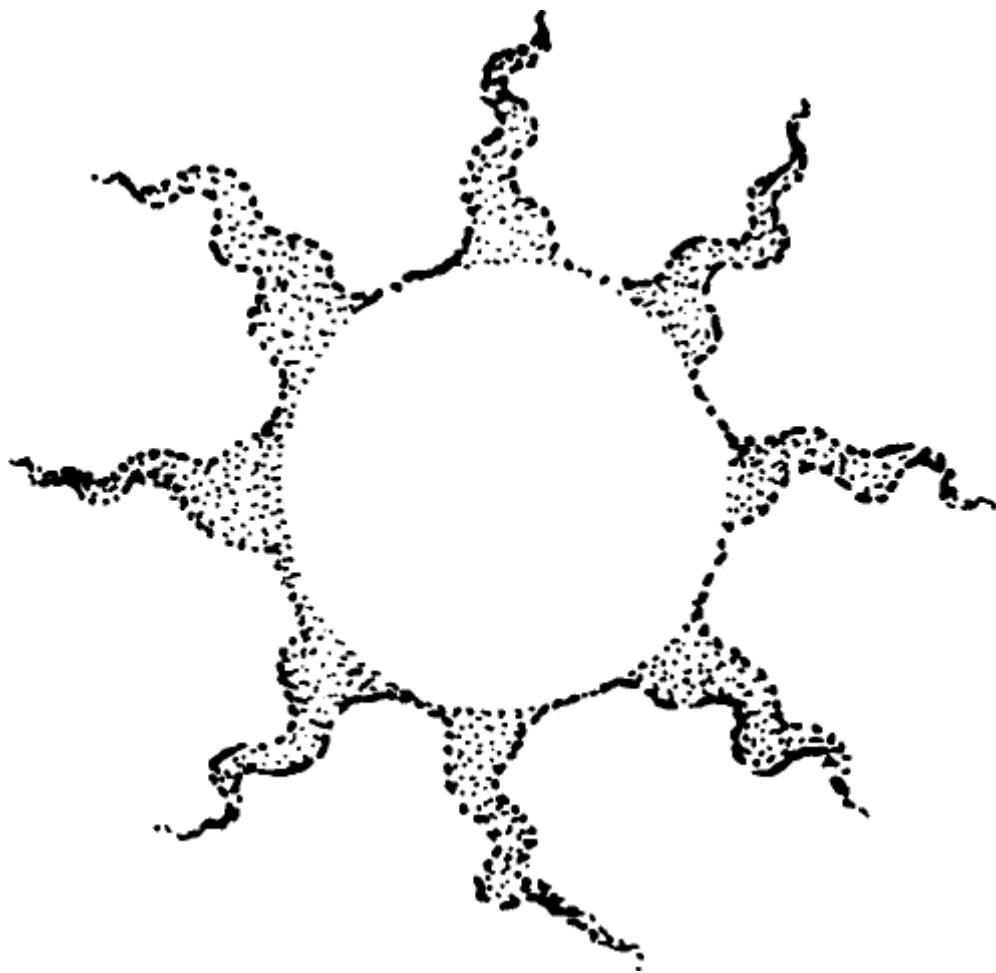


# Sun Printing



# National Mississippi River Museum and Aquarium Conservation Education Curriculum

**Target Grades:** K - 8

**Key Words:** Sun printing

**Subject Areas:** Science, visual arts

Energy from the sun, photograph  
(photo=light, graph =picture)

Vision process using light and photo  
receptors (eyes)

**Duration:** 30 – 45 minutes

Time can be extended by request

**Title:** ***Sun Printing***

Program presented on site at Museum.

**Summary:**

This activity uses a special photo or light sensitive paper, called Diazo paper or blueprint paper to produce an image from the sun's light. By placing an object or transparent line drawing on a sheet of photo-sensitive paper, the light from the sun can produce an image on paper much like a photograph in a camera.

After exposure to the sun the paper is developed in the fumes of ammonia (ammonium hydroxide), and thus making a permanent image on the paper. This is the same

process that has been used for many years to make copies of architect and engineer drawings on to blueprint paper.

**Objectives:**

The objective of this activity can be twofold, one to demonstrate the science of the power of light and discuss its importance to plants, animals, and sight. The other purpose of this activity is to allow students to be creative in producing a light picture or “photo-graph” of an historical drawing or natural object that they can keep as a souvenir or reminder of the lesson learned during their field trip visit.

**Group Size:**

Ideally the number of students corresponds to the number of boards, glasses, and developing containers available, as it is good to have the students arrange the materials or drawings that they will be sunprinting, before receiving their light sensitive paper. Students can share the boards and glasses, as the number of students engaged in exposing their paper to make a sun print will be determined by the number of ammonia developing jars. It works best to develop only one print in the jar at a time.

**Background for Educators:**

It would be good for students to have learned about the importance of sun energy for photosynthesis in plants and the use of light for vision in seeing. It might also be helpful for students to understand how and why a film camera works and what happens when the film is processed.

**Materials Needed:**

Clipboard or heavy cardboard base, glass or acrylic cover, sun printing paper (ammonia developed) in a light tight envelope, food service jar with rocks in the bottom, household or commercial ammonia to be placed in the bottom of the jar.

**Procedure:**

An explanation should be given to students of the importance of light energy to the living things on Earth. Along with the discussion on light energy may also be a discussion of the use of light for seeing and just how this process works. After the students have a chance to grasp these concepts and explanation of the sun printing procedure can be given. It is good to make the parallel connection between the Greek word “**photo**” meaning light and “**graph**” meaning picture.

It is best to do this activity outside in an area where there is full shade and nearby full sunlight. The sun prints can be done on an overcast day, but the exposure time takes considerably longer. The final sun print sometimes turns out even sharper on an overcast day. It is easiest to work from a table top, such as a picnic table, but students can also sit on the ground for this activity.

Boards and glasses should be passed to students and the student should perhaps have a partner who will help hold objects in case of wind. The students should be allowed time to find the flat objects that they want to make sun prints of, either from nature or from a supply of flat objects or drawings provided. Objects such as leaves (green or dried), feathers, flowers, drawings on clear acetate or plastic, seeds, grass, or anything flat will work for the sun print.

The preparation of the sun print should be done in full shade if possible. Objects should be arranged and placed on the board with the glass holding the arrangement in place. It is best to demonstrate the process once before any of the students make their own sun print. This will help the students realize the size that their finished picture will be and just how the process works to produce their finished sun picture.

It should be explained to students that there should only be one exposed paper placed into each jar at a time, and only as many students as there are jars will have a paper at any one time. It is best for the facilitator to manage the paper distribution as when the paper is removed from the light tight container, the objects must be quickly arranged on the paper and covered with the glass. If it takes too long to arrange the objects the final result will be a very faded print, and an unhappy student.

When the objects are arranged on top of the yellow side of the sun printing paper, and the glass put in place, the student can carefully carry the glass and board into the full sun. Care should be taken so that the student does not have their fingers or shadows from their body or other objects over the sun print paper. It is often helpful to place the glass on the paper at an angle thus forming a diamond over the paper. The student can then hold the glass down on the corners not over the sun print paper.

After the sun has changed the visible portion of the paper to completely white (no yellow visible) the sun print should be taken back to a shaded spot and the paper removed from the board and glass. The paper can then be rolled and quickly placed into the ammonia developing jar. The rocks in the bottom of the jar keep the paper out of the liquid ammonia and allow just the fumes to develop the paper. The jar should **not** be shaken while developing the paper as it will splatter liquid and ruin the print.

- ❖ **Warning** –the ammonia has very strong fumes that can irritate or damage nasal and eye tissue so students should be warned not to smell or get their face near the mouth of the jar. The fumes will not hurt hands, but may burn a bit if someone has a cut or sore on their hand. An adult teacher or chaperone should always help younger children if possible.

After several seconds of developing, the paper will turn dark blue where the yellow was covered by the object being copied. If any yellow or green remains on the paper the developing process must continue until everything is totally blue.

### **Evaluation:**

The quality and clarity of the final sun print will evaluate the success of the sun printing process. If the image is faint or too light it was exposed to too much light prior to covering by the object or moving the paper from the glass and board to the developing jar. If the image is blurred or doubled, the objects were moved during exposure (this sometimes gives an unplanned but interesting effect).

### **Additional resources:**

Materials can be purchased from a blue print or engineer supply company. Diazo Products Company manufactures the blueprint paper and the commercial grade ammonia. The ammonia is called Ammonium Hydroxide and is Baume concentrated at 25.5%. If the commercial ammonia is too strong it can be diluted with water. Household ammonia from a grocery store can be used, but the developing time may take several minutes, depending on the ammonia strength and air temperature.

Possible sources for materials are:

- Tri State Blueprint Company in Dubuque, Iowa
- Rapids Reproductions, Inc. in Cedar Rapids 1((800) 383-1223
- Action Reprographics in Des Moines, Iowa 1(515) 288-2146
- Technigraphics, Inc. Iowa City, Iowa
- Matthew A. Rogers, U.S. Specialty Coatings, 713-830-9580

Additional sun printing equipment can be made:

- Clipboards make a good base or 1/8" hardboard or masonite can be cut 10" X 12" at a lumber company
- Double weight glass can be cut to 6" X 6" pieces and sanded or smoothed on all sides at a glass, hardware, or lumber company (make sure they are able to smooth the sharp glass edges) or this can be done on a belt sander or by hand with emery cloth.
- Ammonia jars can be acquired from school food service cafeterias, restaurants, or home supply stores

**Extensions:**

Nature collage of objects collected such as leaves and feathers. Prints made from old photographs to make a cyanograph photograph. Copy of drawings made on clear acetate to show how architectural or engineering blueprints were made.

There is a similar process that can be done on cloth to make sun printed T shirts, wall hangings or quilt squares.

A collection of various leaf shapes from various tree species can be made for leaf identification

**Credits:**

Developed in 2006 by Mark D. Wagner, Iowa State University Extension, Director of Education for the National Mississippi River Museum & Aquarium

***Outdoor Biology Instructional Strategies*** (OBIS) Lawrence Hall of Science, Berkeley, CA.



