The cyanotype photographic process was first developed by Sir John Herschel in the 1840s. Commercial cyanotype paper was available in the 1870s and began to be used by architects for copying drawings (blueprints). Cyanotype printing became popular among amateur photographers toward the end of the 19th century because of its simplicity and low cost. However, the bright blue color of the prints prevented its adoption by most “serious” photographers.

The high energy of ultraviolet (UV) radiation catalyzes many chemical reactions. These include undesirable chemical reactions in biological organisms, such as DNA mutations. We are protected from the sun's UV rays by the ozone layer in the upper atmosphere, although some UV rays manage to penetrate this protective layer. Exposure of the cyanotype paper you can make in lab to UV radiation causes reduction of ferric (Fe$^{3+}$) ions to ferrous (Fe$^{2+}$) ions. A blue image is produced as the ferrous ions react with ferricyanide ions to form insoluble iron(III) hexacyanoferrate(II) or Prussian blue.

Try This

You will need: sensitizer solution, fine-bristle paintbrush or sponge brush, artist's watercolor or bristol paper, hair drier, items to “photograph”, piece of cardboard, piece of cloth, piece of plate glass with sanded or duct-taped edges or a clear acetate sheet and paper clips, 3% hydrogen peroxide solution (optional), and direct sunlight (UV light source).

Note: The sensitizer and paper should be kept away from direct sunlight coming through the windows and fluorescent lights should be turned off. Subdued light coming through the windows and incandescent lights are acceptable.

1. Your instructor will provide the sensitizer solution that contains equal amounts of ammonium ferric citrate solution and potassium ferricyanide solution.
2. Use a brush to apply sensitizer solution to one side of a piece of artist's paper. Apply the solution evenly, with brush strokes in the horizontal direction. Then, without applying more solution, brush in the vertical direction and finally again in the horizontal direction. Do not allow excess solution to remain on the paper.
3. Dry the paper thoroughly with a hair drier. Wet sensitizer will stain negatives and other materials. Place the dried paper on a piece of cardboard to hold it flat.
4. Choose an item you wish to print and place it on the dry, sensitized paper. Things to try: black-and-white negatives (glossy side up), designs drawn with a black felt-tip pen on a clear acetate sheet, paper cutouts, leaves from trees or other plants, a piece of lace, or any flat object with interesting edges.
5. Cover the paper and object with a piece of plate glass with sanded or duct-taped edges to hold the assembly flat when it is exposed to sunlight. If plate glass is not available, paper-clip an acetate sheet to the cyanotype paper. Be sure the clips do not block your image. Cover this assembly with a piece of cloth to carry it into direct sunlight.
6. Place the paper on a stable surface such as a table or the ground. Remove the cloth cover to expose the sensitized paper to direct sunlight. What happens? The length of time needed to see a change will depend on your location, the time of year, the time of day, and cloud density. (For example, the exposure time can be 5 minutes on a sunny summer day, but 20 minutes on a sunny winter day.)
7. When the exposed paper is dark, cover it again with the cloth. Take it inside, remove the cover and object, and wash the paper in a sink under cool running water for 10 minutes. Allow the paper to dry. What color is the paper where UV rays were blocked?
8. You can darken the image by immersing the washed paper in 3% hydrogen peroxide for 10 seconds and then rinsing with water.

Questions

1. Most photographic work involving light-sensitive film or paper must be done in a dark room. Why can paper sensitized to make cyanotypes be handled in a lighted room?
2. The ozone layer in the upper atmosphere protects us from most, but not all, UV radiation. Why is UV light harmful to living organisms, but visible and infrared light are not?

Information from the World Wide Web

1. Cyanotypes by Mike Ware. http://www.mikeware.demon.co.uk/cyanotypes.html
3. UV Primer (click on “UV Primer”). http://uvb.nrel.colostate.edu/UVB/uvb_resources.html

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