NATIONAL PARK SERVICE

Conserve O Gram

September 2011 Number 11/17

Identification and Care of Amber

Introduction

Amber is fossilized plant resin. During burial (fossilization), the volatile components of resin evaporate and the remaining hydrocarbons polymerize and harden. Many museum collections contain amber, including archeological and fine art objects, and natural history specimens, either alone or in combination with other materials. This *Conserve O Gram (COG)* provides guidance on the identification and care of amber. It does not address the preparation or special care of fossiliferous amber.

Physical Properties of Amber

Color and opacity. Amber varies in color from honey yellow to off-white, through shades of brown, yellow and red, to almost black. Rarely, it displays a greenish or bluish hue. Amber ranges from transparent to opaque, depending on the amount of air bubbles and other inclusions present.

Surface luster. Amber is greasy, waxy or resinous.

Hardness. Soft and brittle, amber has a hardness of 2 to 3 on the Mohs scale. It displays conchoidal fracture, breaking along curved surfaces, like glass.

Refractive index. is about 1.54

Amber Products

Amber can be cut, ground, heated, pressed and shaped into a variety of objects. Treated and untreated amber products have similar physical properties, except for color.

Clarified and colored amber. Cloudy amber is slowly heated in a vegetable oil of similar refractive index to clarify it. The oil fills the tiny air bubbles that make it cloudy. Dyes may be introduced to improve or darken the color. Heating can also produce "sun spangles" or "flying saucers," flat circular stress zones that are sometimes marketed as natural inclusions.

Pressed amber or ambroid. Low-quality amber and amber fragments are cleaned of impurities, ground, heated and pressed to form large blocks used to make objects such as smoking paraphernalia, jewelry or ornaments. Ambroid often appears cloudy but pressed amber can also be clarified as described above.

Amber Substitutes

Because of its popularity and high value, many substances are used to imitate amber. These include copal, glass, and various synthetic resins (see *COG* 8/4 "Care and Identification of Objects Made from Plastic").

Copal is a young fossil resin that shares many physical properties with amber. It is more prone to cracking and crazing than amber. It is

slightly softer and more difficult to polish than amber, as heat from friction causes it to soften. Copal is usually clear and pale yellow in color.

Amber colored glass is heavy and much harder than amber. It is cool to the touch.

Plastics, including synthetic resins, are warm to the touch. Many have a refractive index close to that of amber. They may exhibit static electricity when rubbed.

Fossiliferous Amber

Fossiliferous amber contains preserved remains such as insects and plant fragments that were trapped and entombed in the sticky resin. High market value has led to the creation of fakes. Generally, the larger and more perfect the inclusion, the more suspect. Most complete and well-preserved organic remains are tiny. Large insects or small vertebrates normally show detached legs or wings, or other damage.

Authentic inclusions often show evidence of desiccation. To manufacture fakes, dried specimens of extant species may be set into synthetic resin. Alternatively, a piece of real amber is cut in half or drilled, a dead insect inserted, and the cavity filled with a synthetic resin or melted natural resin. Look for telltale discontinuities that indicate joins or filled cavities.

Testing for Amber

Several simple visual observations and non-destructive tests can help distinguish amber from amber substitutes. There are other tests but as they are either potentially damaging or destructive, they are not included here. Note that "passing" a test does not guarantee the substance is real amber. However, failing does mean that it is not.

Casting signs. Examine the pieces for signs that the object has been cast, such as flow lines parallel to the surface, mold marks and lines along edges. Genuine amber does not show casting signs.

Warm to touch. Amber is a poor conductor of heat, making it warm to the touch. Glass substitutes are cool to the touch. As most plastics are warm to the touch, recognizing plastic "amber" can be difficult. When rubbed briskly, amber may be charged with static electricity, and may attract dust or small pieces of paper to its surface.

Odor. The heat of friction from rubbing may produce a faint telltale odor. Amber and copal have a piney odor, and plastics may have an unpleasant acrid or sickly sweet odor.

Hardness and weight. Amber is soft and brittle, and feels light for its size. Glass and some plastics are harder and heavier than amber.

Long-wave ultraviolet radiation. Amber fluoresces milky white to yellow. Some copal and modern resin may also faintly fluoresce like amber. Some plastics fluoresce purple. Coatings of oil or synthetic resin can interfere with fluorescence tests.

Causes of Deterioration

Amber exhibits physical degradation in the form of cracks, crazing (broad network of fine surface cracks), and crizzling (dense network of fine surface cracks) that may lead to exfoliation or disintegration. See Figures 1-3. Degraded amber has undergone significant levels of oxidation.

Figure 1. Baltic amber with a spider inclusion, with a pattern of crazing on a polished edge

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Figure 2. Crazing on the surface of a 1 cm amber bead.

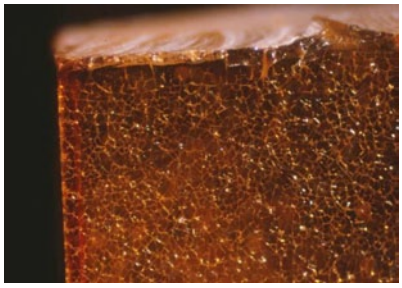

Figure 3. Crazing on the surface of a 1 cm amber bead.

Light. Exposure to visible light, and to ultraviolet (UV) radiation in particular, results in high oxidation even though physical degradation may not be immediately evident.

Relative humidity (RH) extremes and rapid fluctuations. Rapid environmental changes, especially within a low RH range, increase the likelihood of damage.

Heat. Heat causes amber to darken and dehydrate. Amber's melting point is between 295 and 395° C.

Chemicals. Vapor phase pesticides and other biocides, cleaning agents, and corrosion inhibitors may alter the surface of amber specimens. Therefore, always exercise caution when cleaning items, in particular mixed media items containing amber. **Do not allow the application of substances to the specimen.** When in doubt, do nothing and consult a conservator for guidance.

Note: Preventive conservation of amber in composite objects can be complicated by the requirements of other materials, such as amber set in silver and ivory.

Caring for Amber

Do	*Do Not*
Eliminate exposure to ultraviolet radiation.	Expose amber to ultraviolet radiation.
Limit exposure to visible light on exhibit and in storage.	Expose amber to high intensities of visible light for extended periods.
Maintain a stable storage environment of temperature (60 - 65 degrees F) and RH (45% - 55%.)	Expose amber to extremes of RH or temperature, especially very low RH or to rapidly fluctuating RH or temperature.
Avoid exposure to heat. Use only indirect or cold (e.g. fiber optic or LED) lighting for exhibit, microscopy and photography to avoid heat buildup.	Expose amber to heat buildup for any length of time, during photography, examination, or in exhibits. Heat causes amber to darken.
If dusty, wipe amber lightly with a soft dry lint free cloth.	Expose amber to any liquids.
House amber in museum quality (neutral pH) materials or containers.	Expose amber to fumigants, solvents, household cleaners or corrosion inhibitors in liquid or vapor form. These may soften the surface of amber, allowing dust to stick to it, and may contribute to surface oxidation and subsequent degradation.
Use only soft, museum quality (neutral pH) shock absorbent support systems in storage and display. Polyurethane foam exudes oily volatiles that may react with amber.	Use buffered tissue or other buffered storage materials (even if they are called “archival”). These materials often have a high pH and may react with the amber.
Store small individual pieces of amber in individual containers, such as resealable high-quality polyethylene plastic bags or lead-free glass containers. Use museum quality, pH neutral paper labels.	Store amber in mineral oil, glycerin or any other chemical. Oils are impossible to remove and may contribute to degradation.
Document and date all materials used to coat, clean, examine, or treat amber, such as polishing agents, immersion fluids for microscopy, consolidants, mounting mediums or adhesives. If you have questions, consult a conservator.	Allow any materials, including coatings to be applied to amber without consulting a conservator. Remaining traces can react with substances used in subsequent treatments.

References

Grimaldi, David. 1993. "The Care and Study of Fossiliferous Amber." *Curator* 36, no. 1, pp. 31-48.

Howie, Francis M. 1995. "Aspects of Conservation of Fossil Resins and Lignitic Material" in *The Care and Conservation of Palaeontological Material*, edited by Chris Collins, 47-52. Oxford: Butterworth-Heinemann Ltd.

Rice, Patty C. 2006. Amber: *The Golden Gem of the Ages*. 4th Edition. Author House. Bloomington, Indiana.

Waddington, Janet and Julia Fenn 1988. "Preventive Conservation of Amber: Some Preliminary Investigations". *Collection Forum* 4, no. 2, pp. 25-31.

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