

Shell

Found in such items as beads, buttons, jewelry, and vessels

Identification and General Information

Shells are the calcium-containing outer protective covering of invertebrate animals known as mollusks. The most commonly used shells are those of snails, clams, oysters, and mussels.

Generally, these have been used for decorative purposes more than as structural parts or tools.

Although shells from these different kinds of mollusks are identical in composition, they are quite distinct visually from each other and from other materials, which facilitates their identification.

Clams, oysters, and mussels are called *bivalves*, because their shell consists of two halves (or valves) connected by a flexible hinge. The outer surface of bivalve shells can be light or dark colored and is usually slightly porous in texture. The interior surfaces are smooth and shiny and often display colors of pink, green, yellow, and red. These surfaces are often referred to as mother-of-pearl and are widely used in decorative items.

Snails, both land and aquatic types, have a single shell in which the animal lives. The exterior surfaces of most snail shells are compact, shiny, and smooth. They may be one color or have various patterns.

All shells consist of a matrix of calcium carbonate covered with a noncalcareous membrane called the periostracum, which is similar to the periosteum on the outer surfaces of bones. The protein component of shell is called conchiolin, which is the molluscan equivalent of collagen.

As the periostracum membrane dries and flakes from the shell, it breaks the delicate

growing outer edge of the shell. The shell then becomes susceptible to deterioration by acids. Acid can be present in groundwater and cleaning solutions and as vapor from wood and other construction materials used for storage, shelving, and display. Acid vapors in the presence of water vapor can dissolve the carbonate portion of shell and form fuzzy crystals on the surfaces. Conservators refer to the appearance of these crystals as “Byne’s Disease.” This type of deterioration can destroy or permanently disfigure the surface of finely etched and decorated shell items.

Shell can also be affected by high relative humidity and high temperatures (see Basic Care and Storage section). Being hard and somewhat inflexible, it can break when improperly packed, transported, or dropped.

In general, the conversion of shells for use in items includes the following essential steps:

1. Detaching: separating the shells from the viscera of the animal
2. Cleaning: removing sand and dirt from the interior and exterior surfaces
3. Working: drilling, grinding, incising, and coloring

The deterioration of shell is caused by

- acids and acid vapors, which dissolve calcium carbonate;
- the delicate, brittle nature of shells, which makes breakage a constant problem;
- excess heat, which leads to loss of moisture, resulting in shrinkage and cracking;
- excess moisture, which leads to swelling, distortion, and deterioration of the material and which can promote mold growth and further damage.

The following descriptions further clarify this material.

- *Shell*: the calcium-containing outer protective covering of invertebrate animals known as mollusks.
- *Periostracum*: a noncalcareous membrane covering the exterior surfaces of the shell.
- *Conchiolin*: the protein component of shell, which is the molluscan equivalent of collagen.

Basic Care and Storage

Shell items are especially prone to deterioration by acids and acidic materials. Storage or display on corkboards or in wooden cabinets, especially those made of oak, will destroy shell items, turning them into white powder over time. Untreated oak and most other hardwoods give off acetic acid (vinegar), which can dissolve calcium carbonate. Formic and other acids are in certain adhesives used in the manufacture of Masonite, plywood, and particleboards. Consult a conservator for information on safe storage and display materials. Do not glue or attach shells to a support as the adhesive will stain the shells, and breakage may occur during removal.

Buffered rather than unbuffered board and paper materials can be used for storage and packaging of shell items, as the calcium carbonate in the board and paper will help neutralize acid vapors before they can attack the shell surfaces.

A consistent temperature and humidity are particularly important for the preservation of shell items. Refer to *Basic Care* for general storage information.

Special Pest Concerns

Shell items can become infested with mold, particularly if the relative humidity in the storage or display area is allowed to exceed 60 percent for long periods. Mold infestations can be recognized by a fuzzy growth on the surface of objects that is usually white or greenish.

Consistent ventilation and air circulation in storage and display areas will help to prevent mold infestations. If mold growth does occur, take measures to reduce the relative humidity, and contact a conservator for advice on how to clean the affected surfaces safely. Personal safety is the primary concern when dealing with mold infestations, as many types of mold can cause serious and permanent health problems.

Routine Handling

The general methods and techniques for the proper handling of all items apply as well to shell items (see *Handling Practices*). These items can be handled with bare hands as long as they are clean and dry. Body oils, however, can stain the porous shell surfaces, especially those that are light colored, so cotton or latex gloves are recommended for handling these items.

When lifting and moving an item composed of or including shell, make certain that it is supported well and that no stress is placed on weak areas. Use a tray or other support if necessary. This tray can be made from a piece of acid-free corrugated board that is cut to the standard sizes of drawers or other storage units.

Display Issues

The temperature and relative humidity ranges mentioned in the Basic Care and Storage section also apply to display conditions. Most important, when used for display, shell items must be protected from acidic materials. Refer to the display guidelines in *Display* for light levels, handling, and other issues.

Mounts and Supports

Many museum personnel can fabricate external supports from acrylic plastic sheeting, such as

Plexiglas, using heat to conform the acrylic to an item's surface shape. This requires only minimal tools and training. Avoid any mount or support that will cause abrasion and breakage, for example, unpadded wires or screws attached through existing holes. All adhesive mounts should be avoided. Adhesives can cause surface damage, resulting in irreversible staining and loss of texture.

Cleaning and Minor Repairs

Periodic inspection and maintenance is the best way to assure the long-term preservation of shell. Surface dust can be removed with a variable speed vacuum, brushes, and micro-attachments (see *Cleaning Practices*). Before cleaning, carefully inspect the object for loose attachments and fragile decorations such as flaking paint or pigment layers. Consult a conservator for further advice on treatment.

In general, avoid using liquid-based cleaners and detergents or alcohol-based solvents on calcium carbonate items. If after removing surface dust, further cleaning appears to be required, to remove fingerprints, for example, contact a conservator for advice.

Do not use over-the-counter adhesives to repair cracks and breaks, as these repairs are difficult to do and may result in staining and further breakage as the adhesives age. Breaks and cracks can be evidence of use and may provide historical information. In addition, unnecessary repair of such damage can obscure historical evidence. Consult a conservator if major repairs are needed.