A TECHNIQUE TO CREATE FORM-FITTED, PADDED PLASTER JACKETS FOR CONSERVING VERTEBRATE FOSSIL SPECIMENS

Jabo, S.J.; Kroehler, P.A.; Grady, F.V., Department of Paleobiology, Smithsonian Institution, P.O. Box 37012, Natural History Museum, MRC-121, Washington, DC 20013-7012.

Abstract
Over the course of time, fossil vertebrate specimens will start to deteriorate - whether it be from ancient glues and hardeners, ambient vibration, or handling. Many methods have been tried to reduce the wear and tear on specimens, but none seems to fully protect them. The Smithsonian Institution has developed a multi-step process of protecting fossil vertebrates with foam-padded, plaster jackets. Using hydrocal gypsum cement, surmat fiberglass cloth, and ethafoam padding, we create two-sided jackets that bolt together to fully encase the specimens. Handles and feet on either side of a jacket enable a person to lift off a side, fully examine one side of even the most delicate specimen, and then flip it over to examine the other side. This eliminates excessive handling, and reduces the chances for breakage.

An active program has been implemented to jacket all of the Smithsonian's vertebrate paleo specimens. So far, many of the *Brontothere* skulls, toothed and baleen whale skulls, *Plesippus* skulls, *Teleoceros* skulls, turtle shells and sauropod bones have been jacketed. Some of these have already been safely shipped to our Museum Support Center storage facility in Suitland, Maryland, with more of the collections targeted for jacketing and relocation.

Figure 01

Discussion
Vertebrate fossils lying on storage shelves are falling to pieces. Among the causes of this common problem are the deterioration of old consolidants and adhesives, inadequate support for the weight of the specimen, ambient building vibrations, and the handling of the bones by staff and researchers (Figure 01). The Smithsonian Institution's National Museum of Natural History (NMNH) has developed a multi-step procedure to construct two-sided, padded jackets to hold and protect fragile vertebrate fossils. The process is similar to that described by Dan

Chaney in STORAGE OF NATURAL HISTORY COLLECTIONS: IDEAS AND PRACTICAL SOLUTIONS, but with some modifications. In general, hydrocal gypsum cement, surmat fiberglass cloth, and ethafoam padding are used to create two-sided jackets that bolt together to fully encase the specimens. Handles and feet on either side of the jacket enable a person to lift off a side, fully examine one side of even the most delicate specimen, recap it and then flip it over to examine the other side. This eliminates excessive handling while the jacket uniformly supports the specimen and reduces the chances for breakage. The technique has enabled NMNH to repair and jacket many vertebrate fossils in our collections, and all newly prepared specimens automatically get a jacket.

When a specimen is to be jacketed, the first step is to conserve it through cleansing, consolidation, and restoration as much as possible. Broken specimens also need to be repaired. (Figures 02, 03)

Figure 02

Figure 03

Cleaning is generally done with just damp cotton swabs. Occasionally old plaster bases and armature may have to be removed from the fossil before it can be jacketed. Newly prepared specimens should be in a stable state. When the conservation of the specimen is completed, it is necessary to locate a good dividing line to separate the specimen into imaginary halves.

This determines the size and shape of the two sides of the jacket. One detail to look for in a dividing line is a natural separation in the specimen, such as the top and bottom of a turtle shell. It is best to keep any diagnostic elements, like teeth, fully exposed, and the size and weight distribution of the jacket also have to be considered.

Once a dividing line is determined, a two- to three-inch wide flange must be made along this line around the specimen using a material such as sand or cardboard. The quickest and easiest way to do this is to sink the fossil half-way deep in a sandbox, and use the sand surface as the flange (Figures 04, 05). Otherwise, it must be constructed out of cardboard or some other material.

Figure 04

Figure 05

Once the flange is ready, the entire surface is covered with foil (Figure 06). The foil acts as a separator between the specimen and the clay layer that will be applied next. Sheets of silicone-based clean clay are rolled to 3/16-inch, and the entire surface of the specimen is covered with it - including the flange (Figures 07, 08).

Figure 06

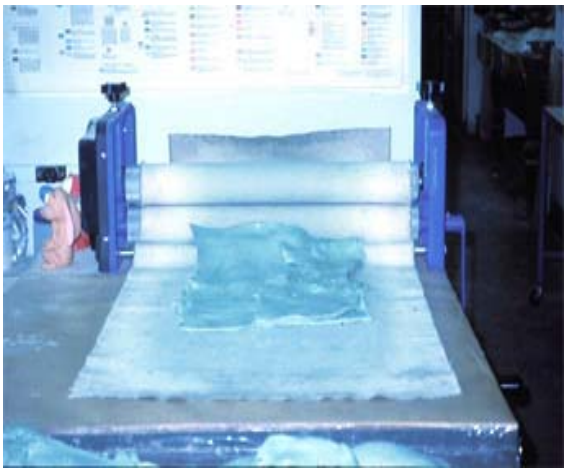

Figure 07

The clay acts as a spacer for where the foam padding will go in the jacket. There can be no “undercuts” on the clay that the rigid jacket will get hung-up on when it is removed. It’s the same principle as making a plaster mother-mold. All of this is covered with plastic wrap, which acts as another separator (Figure 09).

Figure 08

Figure 09

The whole thing is then layered with 10 or 15 mil. fiberglass cloth and liberal amounts of FGR-95 Hydrocal Gypsum Cement. There must be at least four fiberglass / hydrocal layers on the specimen, and five layers around the flange. More layers may have to be applied for large specimens (Figures 10, 11).

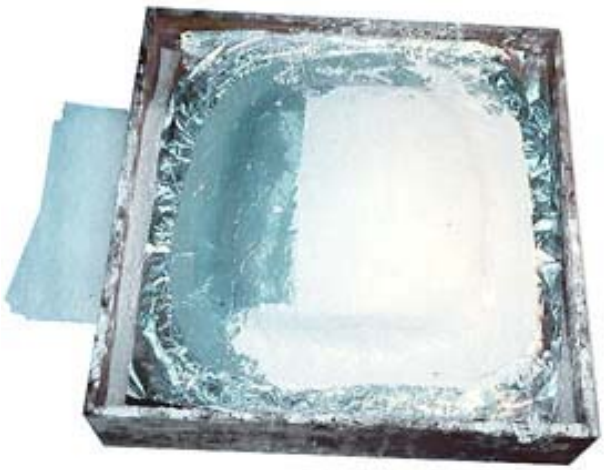

Figure 10

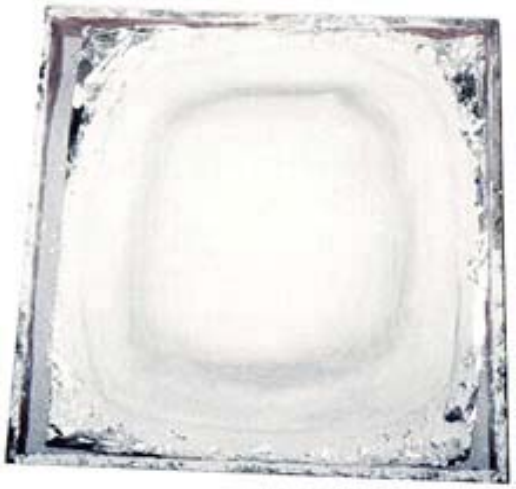

Figure 11

After the layering is completed, it is necessary to ensure that the final product will not rock back and forth while on a flat surface. This is done by constructing feet that the jacket will stand on - along with handles to lift it off. The typical way to build the feet is to form them out of cotton or cheesecloth soaked in plaster and apply them to the jacket at the correct height to level it. Plywood or another flat surface can be placed over the feet while they are drying to ensure that they are level. Handles to lift the lids are made from electrical conduit and incorporated into the feet. (Figure 12)

Figure 12

But in some cases, as with a smaller, simple-shaped specimen, it is easier and more efficient to just make a solid plaster foot with finger holes to lift the jacket off (Figures 13, 14).

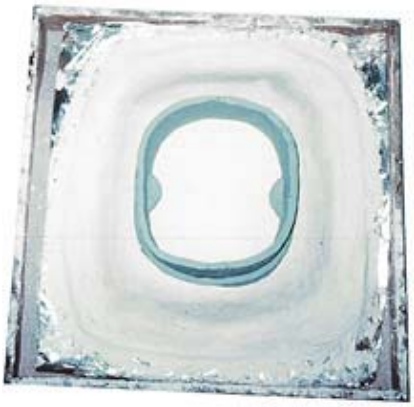
Figure 13


Figure 14

The jacket surfaces, including the feet and handles, must be smooth for comfortable handling.

Now the plaster jacket, plastic wrap, clay and tin foil are removed from the specimen, and the jacket left to dry completely (Figure 15). The edges of the jacket are trimmed and sanded smooth. It is also advisable to take a propane torch and burn off any fiberglass along the edges.


Figure 15

The foam padding can now be adhered to the jacket. Pieces of 1/4-inch, high-density ethafoam are trimmed to tightly fit onto the interior surface and flange of the jacket. A coating of contact cement, such as 3M Hi-Strength 90 Spray Adhesive or MISTY Heavy Duty Adhesive Spray, is applied to the interior surface of the jacket and flange and to the contact surfaces of ethafoam. It is advisable to always wear a respirator with organic vapor filters when applying the contact cement. After waiting the prescribed amount of time, the ethafoam is carefully pressed into the jacket and the surfaces worked completely down (Figure 16, 17).

Figure 16

Figure 17

If possible, the jacket can be put back on the specimen and weighted down until the cement dries to make sure everything stays in place (Figure 18). The foam edges are then trimmed, and the contact cement allowed to completely off-gas. The specimen is put back into the jacket and flipped (Figure 19).

Figure 18

Figure 19

Now, the same general procedures are performed on this side of the specimen. It is layered with a foil separator, (Figure 20) then 3/16-inch of clean clay - but the clay is not applied around the flange on this side of the jacket (Figure 21). Foam will not be applied to the flange on this side either as it isn't necessary to have both flanges with foam on both sides of the jacket. It just uses more foam and makes the jacket that much taller. Plastic wrap is applied as another separator (Figure 22), and then surmat and hydrocal. The jacket is trimmed and

sanded, and the feet and handles are constructed for this side (Figure 23). Then ethafoam is adhered to the inside of this jacket - but not around the flange.

Figure 20

Figure 21

Figure 22

Figure 23

Holes are drilled through the flange, and 1/4-inch bolts, washers, and wing nuts are inserted to hold the jacket together (Figure 24). The appropriate data to identify the specimen is written on the outside of the jacket (Figure 25).

Figure 24

Figure 25

Sometimes a photograph of the specimen can be attached to the jacket for easier identification. Now the specimen can studied, and any unnecessary handling is eliminated (Figures 26, 27). It is also ready to be transported and placed into the collections (Figures 28, 29).

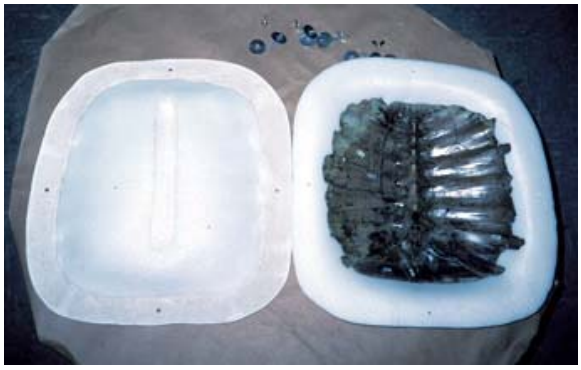

Figure 26

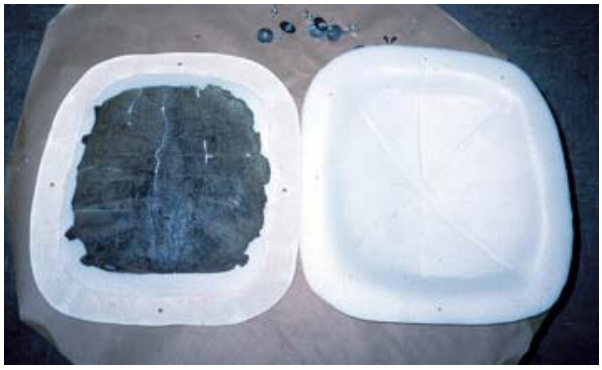

Figure 27

Figure 28

Figure 29

References

Chaney, Dan S., 1992. Encapsulating support for large three-dimensional fragile specimens; in Storage of Natural History Collections: Ideas and Practical Solutions.