

INTRODUCTION: Native American tribes of the Central Plains traditionally employed brain-tanning to prepare animal skins for use; the hide is de-fleshed, a partially cooked slurry of brains is applied to the surface and repeatedly stretched. The triglycerides, phospholipids, and lipoproteins in the brain bond with the collagen fibers in the skin to create a soft, supple material. Brain-tanned hides demonstrate a greater sensitivity to heat and water than do skins which have been mineral or vegetable tanned, restricting the range of materials employed in their repair. Conservation interventions for objects manufactured from brain-tanned hides are further influenced by type of hide (i.e. source animal), state of deterioration, morphology of the tears, and method of manufacture. We explore the inherent challenges and solutions for tear repair on two pairs of beaded, brain-tanned moccasins from the Fowler Museum's collection.

Case Study A: Moccasins are composed of brain-tanned, cow-hide uppers and rawhide soles. The leather is embrittled, torn in multiple areas and the sides have collapsed inward, lending the pair a flattened appearance.



X75.1300 before treatment.

Repairs were carried out using a combination of BEVA 371 and lambskin condoms.



Detail before treatment.



Detail after treatment.

Natural skin condoms are manufactured from the cecum of the large intestine of a sheep. Unlike goldbeater's skin, which is split during processing, the intestines used in lambskin condoms retain their full thickness. The soft beige coloration and stiff, thick feel of lambskin creates a visually sympathetic and sturdy repair for the embrittled leather. Lambskin also proved an ideal carrier for BEVA 371. The adhesive-substrate combination supports tears under light tension, but fails appropriately with further stress.



Condoms were washed with Orvus nonionic detergent to remove lubricants and rinsed with de-ionized water. Each was then cut open and laid flat to dry.



BEVA 371 was diluted with toluene to create a soft, spreadable paste and applied by brush. Corners were rounded to avoid lifting edges.



While drying, repairs were clamped in place using Nyodium rare earth magnets padded with Volara foam.

SELECTION OF REPAIR TECHNIQUES AND MATERIALS

ADHESIVES AND SUPPORTS CONSIDERED

Due to the leathers' low shrinkage temperatures (30-40°C), pressure-sensitive and solvent-borne adhesives were sought. As support materials must be visually sympathetic as well as pliable enough to conform to and flex with the leather, spun bonded polyester fabrics and intestine derived materials were chosen for consideration. Each adhesive-carrier combination was evaluated to assess tack, bond strength and flexibility.

ADHESIVE	BEVA 371 in TOLUENE			
SUPPORT	Goldbeater's skin	Lambskin condom	Reemay	Hollytex
TACK	None	None	None	None
BOND STRENGTH	High	High	Low	Low
FLEXIBILITY	Limp	Flexible	Rigid yet pliable	Flexible

ADHESIVE	LASCAUX 1:1 360:498			
SUPPORT	Goldbeater's skin	Lambskin condom	Reemay	Hollytex
TACK	Moderate	Moderate	High	Low
BOND STRENGTH	Low	Low	Moderate	Moderate
FLEXIBILITY	Limp	Flexible	Rigid yet pliable	Flexible

STITCHING MATERIALS CONSIDERED

A variety of stitching materials were considered for areas where preexisting holes are present. Filament threads are especially appropriate for stabilization stitching, and appear nearly invisible.

TYPE	CHARACTERISTICS
Hair Silk	100% silk; chosen for its fine, smooth finish, and ease of use
Stabiltex/Tetex® (thread drawn from fabric)	100% polyester; chemically stable, yet difficult to extract and too strong

Case Study B: Moccasin is buckskin with legging attachment and rawhide sole. Leather retains flexibility yet is thinned, stretched, and severely degraded. Extensive tears require repair to restore structural stability.



X66.2176A before treatment.



A combination of sewing and a 1:1 solution of Lascaux 360:498 on Reemay was employed to join tears between the upper and the sole.

Reemay provides a firm backing for the flexible, degraded leather and it is a suitable support for Lascaux adhesive. The system forms a mechanically reversible joint, yet allows gentle handling and manipulation of the moccasin. As a spun bonded polyester fabric, Reemay is easily sewn through. Hair silk is particularly appropriate for use in mending sinew-joined leather moccasins, as it is proteinaceous and easily passes through original holes along extant sinew threads.



In order to avoid sewing directly into the leather, a section of Reemay was toned with acrylics and adhered to the interior of the upper with 1:1 Lascaux 360:498.



The toned Reemay was folded horizontally to emulate the two-layer sole, and sewn to the sole through the original stitch holes using a modified whipstitch and size 16 (very fine) embroidery needle.



The method allowed the leather sole 'selvage' and the Reemay 'selvage' to create a butt joint. A modified self-couching stitch secured the thread's tail to avoid using a knot, enabling facile removal or retreatment.