

HISTORY'S FOOTPRINTS

The Museum of Indian Arts and Culture's *Stepping Out* exhibition gives us occasion to examine the meaning-packed relics of an anti-barefoot movement.

By Laurie Webster

VISIT THE STORAGE FACILITY OF ANY

Southwestern anthropology museum, and you'll see drawer after drawer of pre-Hispanic woven sandals—a few in pristine condition, but most worn out from use. Their sheer quantities are astonishing because early Southwesterners didn't actually need footwear. Human feet develop thick calluses to protect them from sharp objects and hot and cold temperatures, and for most of human history, people went around barefoot. Today our feet are tender because we wear shoes, but the use of footwear is essentially a cultural and sartorial choice in all but the most extreme climates.

Ancient sandals survive to a greater extent than most other woven items at archaeological sites because of their sturdy construction. Early Southwestern weavers fabricated their sandals from the leaves and fiber of yucca plants, and occasionally other materials, using the finger-weave techniques of plain weave, twining, braiding, and wrapping. Weavers equipped the sandals with toe or side ties to attach them to feet, and they sometimes padded the shoes with leaves or shredded bark to insulate them. Hide sandals and moccasins have also been found at some Southwestern archaeological sites, but they were never as popular as sandals until after about AD 1400, when sandals fell out of use and hide footwear replaced them. The impetus for this change was probably the growing interaction between settled, agricultural Pueblo groups and their Navajo, Apache, Pai, and Plains neighbors, and the increased importation of hides into these agricultural communities.

Just as we do today, early Southwestern groups used different styles of footwear and other types of clothing to express their social identities. During various time periods and in different regions of the Southwest, people furnished their sandals with distinctive toe and heel finishes, borders, and sometimes raised treads to distinguish them and their tracks from those of their neighbors. Low-visibility construction attributes provide information about cultural transmission and learning networks, while more visible decorative features express social group identities. Because of the temporal and regional diversity of sandals, they can be used like ceramics and projectile points to identify past cultural groups in the archaeological record.

Particular footwear styles were probably linked to wearers' age, gender, ceremonial roles, or activities such as warfare,

hunting, or long-distance trading. The archaeological record hints that men and women wore different sandal styles. Historically, Pueblo men and women have worn different styles of moccasins, so why wouldn't their ancestors have worn different sandal styles in the pre-Hispanic past? Funerary data suggest that, during the early Basketmaker period, the coarse weft-faced wickerwork sandals and decorated twined sandals were worn primarily by men, and that women often used sandals with a different style of lacing. After about AD 700, people in the northern Southwest were rarely interred with footwear on their feet, making it difficult to link different sandal styles with gender. Perhaps future DNA studies can help address this question.

I first became interested in ancient sandals thirty years ago, when I began my studies of archaeological textile collections from the northern Southwest. Since then, I have become fascinated with the diversity of sandal styles and technologies. The earliest yucca sandals from the northern Southwest, used by Archaic hunter-gatherers, have been radiocarbon-dated to about 8,000 years ago. Two styles were worn: an open-twined sandal with the wefts worked in two-strand twining, and a warp-faced plain-weave sandal with multiple warps worked in an over-one, under-one weave (Figure 1). In twined and plain-weave sandals, the warp elements run lengthwise, and the weft elements cross and interact with the warps. Open-twined sandals faded from the archaeological record by about 5500 BC, but the warp-faced plain-weave style persisted into the Late Archaic period and may have evolved into the weft-faced plain-weave (wickerwork) sandals of the Basketmaker II period, which I discuss below.

Archaic hunter-gathers of the southern Southwest (southern Arizona and New Mexico, and the Trans-Pecos region of Texas) also wore plain-weave sandals, but they were different from those of the northern Southwest. Their sandals were weft-faced rather than warp-faced, and the earliest examples, dated to about 5,000 years ago, had only two warps. Later, four-warp and other multiple-warp varieties appeared in the region.

As Southwestern groups adopted maize agriculture and became more settled, their sandal styles became increasingly differentiated, and in some cases, more elaborate. Most of

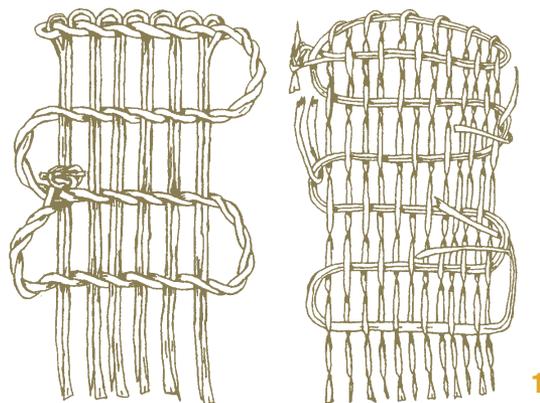


Figure 1 Construction methods for Archaic open-twined (left) and warp-faced plain-weave (right) sandals from the northern Colorado Plateau. Illustration courtesy of Phil Geib.

Figure 2 Four-warp plain-weave "wickerwork" yucca leaf sandal with toe fringe, toe loop, and remains of heel strap, southeastern Utah, ca. 200 BC–AD 200. Photograph courtesy of the American Museum of Natural History, Cat. No. H/12425.



Figure 3 Four-warp plain-weave yucca fiber sandal with pointed toe, unprovenanced site but probably northern Southwest, ca. AD 650–1100. MIAC 53773/11. Photograph courtesy of the Museum of Indian Arts and Culture.

Figure 4 Two-warp scuffer toe yucca leaf sandal with fishtail heel, U Bar Cave, southwestern New Mexico, ca. AD 1300. MIAC 26576/11a. Photograph courtesy of the Museum of Indian Arts and Culture.

Figure 5 Pair of child's twined yucca cordage sandals with buckskin fringe, toe, and heel loops and chevron design, Butler Wash, southeastern Utah, 202–19 cal. BC (AMS date). Photograph courtesy of the Field Museum of Natural History, Cat. No. 164802.

these sandals feature plain weave, twining, or braiding. In the following sections, I briefly review the historical development of these major styles and contrast the types people wore in the northern and southern Southwest.

PLAIN WEAVE SANDALS

As noted, plain-weave sandals are one of the earliest forms of footwear on the Colorado Plateau. Thick, coarse, rigid, and easily manufactured, most were designed for rugged use. During the Basketmaker II period in the northern Southwest, weft-faced plain-weave wickerwork sandals with usually four, but sometimes five, six, or more warp elements fulfilled this role. Most have a warp and weft of whole yucca leaves, although juniper-bark and turkey-feather-cordage versions are also known. Stylistically, they have a square toe and heel, and many from northeastern Arizona and southeastern Utah have a toe fringe produced by extending the warp ends past the toe (Figure 2).

Around AD 650–700, a new style of plain-weave yucca sandal appeared in the northern Southwest. This coarse sandal had four to six warps, yucca leaf or fiber wefts, and a rounded or pointed toe, and it remained in use for about 400 years (Figure 3). A later variation has an elongated body that was folded up in back to cover the heel. The only two-warp style to gain popularity in the northern Southwest was a narrow sandal made of rigid, narrowleaf yucca wefts worked in a figure-eight weave, the ends shredded on the underside to make a pad, used after about AD 1000.

In the southern Southwest, the two-warp weft-faced plain-weave style of the Archaic period was used into late, pre-Hispanic times. Sometime around 200 BC, rigid plain-weave yucca sandals with four or more warps became popular in the Mogollon culture area of southwestern New Mexico. With a square toe and heel, these four-warp wickerwork sandals resemble the ones people in the northern Southwest wore, but they lack the toe fringe.

Several hundred years later, people in the Mogollon region created a more refined plain-weave sandal with fine cordage elements and a concentric warp. People along what is now the US–Mexico border of the southern Southwest adopted two variations of two- and four-warp wickerwork plain-weave sandals from the Trans-Pecos area: the *scuffer-toe* (a short sandal

that covered just the ball of the foot), and a sandal with what is known as a fishtail heel. Some sandals incorporated both features (Figure 4).

TWINED SANDALS

The most finely woven, elaborate, and in my view, intriguing Southwestern sandals are the twined yucca cordage sandals of the northern Southwest. Closely linked to the Ancestral Pueblo culture of the Colorado Plateau, these sandals appeared in the Four Corners region in about 100 BC and persisted into the early-thirteenth century. Commonly referred to as twined sandals, most incorporate several weave structures, including twining, plain weave, and weft-wrapping.

The earliest versions are closely linked to the western variant of Basketmaker II culture. Most have square toes and heels, like the coarser plain-weave sandals of this period. Regional variations occur. The fanciest ones originated in southeastern Utah and northeastern Arizona, where the majority have a bolster or buckskin fringe at the toe; some have geometric or banded designs on the upper face; and most have horizontal ridges on the underside that served as a raised tread (Figure 5). The upper faces are woven primarily in plain weave (sometimes twining), and the raised tread was produced by a wrapped twining technique. Intriguingly, many have a row of human hair twining just below the buckskin fringe. People used human hair for a variety of weaving purposes during this period and, as documentation for the use of hair ties at historic Hopi sites shows, the choice of hair possibly was based on kin relationships.

Sometime around AD 300, the center of decorated twined sandal complexity shifted to northeastern Arizona, where it remained for several hundred years. During this time, twined sandals with slightly scalloped toes, colored geometric designs on the upper face, and raised, geometric designs on the soles appeared in this region (Figure 6). The apex of twined sandal production occurred in the Four Corners region between AD 600 and 750, when the most elaborate examples have a scalloped or rounded toe, a puckered heel, multiple zones of colored designs on the upper face, and highly complex geometric patterning on the sole. The production of these sandals was a technological feat. Some incorporate as many as fourteen weave structures, all variants of twining, plain weave, or weft-wrapping.

THE SOLUTION THAT STICKS

by Peter BG Shoemaker

Few things make a conservator swoon quite like a good adhesive. After all, in a business that often begins with lots of things falling apart, a good adhesive can be the difference between smiles and frowns around laboratory worktables in conservation labs the world over.

So imagine fifty or so pairs of moccasins, almost all heavily beaded, in various states of disrepair—tears in the heels, thread unraveling, some folded into themselves like scared armadillos, and all the gashes and distresses of a lifetime of wear and—in some cases—six to twenty lifetimes of storage. This enormous challenge faced conservators working to prepare the heart of the *Stepping Out* exhibition. In their arsenal: their own skilled and nuanced handiwork, and a wonder adhesive they call BEVA 137.

Before BEVA enters the picture, the three conservators have other steps to complete. Maureen Russell, Sophie Hunter, and Larry Humetewa clean the moccasins, slowly and meticulously removing mud, dust, and whatever other detritus collects on beaded buck and buffalo hide over vast epochs of time. When necessary (and that is often), they painstakingly rehydrate the hide, using water and ethanol and a variety of handcrafted supports, clamps, and forms.

BEVA got its start in painting conservation when—in 1967—Gustav Berger (that's the B, followed by Ethylene Vinyl Acetate) went searching for a better way to line paintings—a widely used practice that strengthens an existing painting by essentially adding another layer of canvas, or in cases of serious decay, replacing the canvas entirely. According to his obituary by Janice Hill Stoner, published on the International Institute for Conservation of Historic and Artistic Works website, "He had grown up with art; his father and grandfather were presidents of the Art Dealers Association in Austria, and his father had sent him to look at the treatments being carried out by his restorers." Clearly, Berger wasn't content with what he found.



Figure 6 Upper and lower faces of a twined yucca cordage sandal with colored geometric designs on the upper face and raised geometric designs on the sole, Tseahatso Cave, Canyon del Muerto, northeastern Arizona, ca. AD 500–600. Photograph courtesy of the American Museum of Natural History, Cat. No. 29.1/1655.

Figure 7 Twined yucca cordage sandal with slit-tapestry design and jog toe, West Ruin of Aztec, northwestern New Mexico, ca. AD 1110–1150. Photograph courtesy of the American Museum of Natural History, Cat. No. 29.0/5289.

Figure 8 Coarsely woven 1/1 braided yucca leaf sandal, southeastern Utah, ca. AD 900–1270. Photograph courtesy of the American Museum of Natural History, Cat. No. H-12404.

People in the northern Southwest continued to make twined sandals after AD 750, but they used simpler patterns and weave structures. Those sandals from between AD 1050 and 1150 tend to have simple bands or bold tapestry designs on the upper surface, and isolated, raised diamonds or triangles on the soles. By this time, the toes of the sandals were shaped for the right or left foot, and people began embellishing the toes with a small projection, or jog, along the outer edge (Figure 7). Some archaeologists have interpreted this jog as a symbolic sixth toe, an idea that Patricia Crown and colleagues corroborate in a recent *American Antiquity* article, which documents the presence of polydactyly, a congenital condition resulting in an extra finger or toe, among several high-status burials at Pueblo Bonito in Chaco Canyon. Significant assemblages of jog-toed, twined sandals have been recovered from Chaco, the West Ruin of Aztec, and Antelope House in Canyon del Muerto, and additional examples have been found at smaller sites in the Four Corners region that appear to have had links to Chaco. Their use may have signaled a symbolic connection to the Chaco leadership, religion, or political system.

The final iteration of twined sandals dates to the late-twelfth and early-thirteenth centuries. These sandals are coarser in texture than their predecessors, and have bold, raised designs on the soles produced by massive weft-wrapping. Around AD 1250, this long-lived and unique sandal tradition disappeared from the archaeological record. We still do not know whether these finely woven sandals served specific symbolic or ceremonial roles, or were simply a fancy form of footwear, but their elaborate iconography, evident labor investment, and demonstration of specialized technical knowledge suggest that they were something very special.

BRAIDED (PLAITED) SANDALS

Braided sandals, also referred to as plaited sandals, were the last major sandal tradition to appear in the Southwest. Made from whole or split yucca leaves, most are woven in 1/1 (over one, under one), 2/1 (over two, under 1), or 2/2 (over two, under two) diagonal interlacing. Because the weave structures of the 2/1 and 2/2 braided sandals resemble those of twill-woven fabrics, they are often described as twill-plaited constructions.

In the northern Southwest, braided sandals appear earlier in the eastern portion of the Colorado Plateau than they do in the

He experimented with a variety of wax-resin combinations, trying to find the right mix of stability, longevity, low melting point, setting speed, and reversability. From among hundreds of these combinations he selected number 371—the first adhesive created for conservation use.

Conservators love BEVA because it provides a reversible medium that is both chemically stable and offers elasticity. Reversibility and chemical stability are of crucial importance for conservators the world over, and its elasticity makes it ideal for working with textiles and leather. And because it is a heat-seal adhesive—both bonding with, and essentially shrink-wrapping itself around uneven surfaces, it is ideally suited for work with errant pieces of thread, very tiny beads, and small tears. In other words, just what the doctor (Berger) ordered for *Stepping Out*.

Born in Austria, Berger served in the Israeli army before coming to New York. In a different time, maybe, he would have been considered an irrepressible natural scientist—a Robert Boyle sort of character—tinkering and experimenting constantly in an effort to improve the world around him. Although separated by 350 years, both men believed in experimentation as the path to knowledge, and both kept at it most of their lives. Like Boyle, Berger was both a hands-on practitioner and a legendary teacher, crisscrossing the world to give talks and demonstrations.

In over 60 research papers over nearly 40 years, Berger presented new ways to support large paintings, pioneered the study and remediation of paint cracking, developed innovative approaches to filling damaged surfaces, and of course, came up with BEVA.

During a recent visit, conservator Maureen Russell worked on a pair of Cheyenne/Sioux moccasins with blue and white beads, each maybe a millimeter or two in diameter, that depict bison footprints. She points out several places where threads holding beads are coming loose.

Using a strip of BEVA—imagine a piece of Scotch tape about a centimeter long and two-thirds of a centimeter



Figure 9 Finely woven 2/2 twill-plaited yucca leaf sandal with jog toe, West Ruin of Aztec, northwestern New Mexico, ca. AD 1110–1200. Photograph courtesy of the American Museum of Natural History, Cat. No. 29.0/8855.

Figure 10 Coarsely woven 2/1 braided yucca leaf sandal, cave in Magdalena Mountains, west-central New Mexico, ca. AD 900–1200. MIAC 43371/11a. Photograph courtesy of the Museum of Indian Arts and Culture.

Figure 11 Braid-like sandal of yucca or agave fiber, Winchester Cave, southeastern Arizona, ca. AD 800–1250. Photograph courtesy of the Amerind Foundation, Inc., Cat. No. WIN/101a.

west. The presence of 2/2 twill-plaited sandals at the Durango Rock Shelters, a Basketmaker II site, led archaeologists to believe that they dated to that period, but a recent radiocarbon date from one sandal indicates that they were intrusive to the site, and actually date to late Basketmaker III. Additional radiocarbon dates from northwestern New Mexico support the appearance of 2/2 twill-plaited sandals in the upper San Juan River region between AD 600 and 700.

Braided sandals were well-established in the Four Corners region by the Pueblo I period. One style from southwestern Colorado and northwestern New Mexico was worked in fine 2/2 twill plaiting and had a square toe and cupped heel. Another early braided sandal, more common to southeastern Utah and northeastern Arizona, was coarsely woven in 1/1, 2/1, and less often 2/2 diagonal interlacing. It had a distinctive square heel made by vertically wrapping the lower ends of the braiding elements over a crosswise element and up to the surface (Figure 8). Many of these sandals were shaped for the right or left foot, suggesting manufacture after AD 900.

During the Pueblo II period, people in the Four Corners region of the Colorado Plateau began making finely woven 2/2 twill-plaited sandals with tapered toes and slightly cupped heels. By AD 1050–1100, many of these sandals, like their twined counterparts, were equipped with a toe jog (Figure 9). By the thirteenth century, 2/2 twill-plaited sandals and coarser 1/1 and 2/1 braided sandals were the most common footwear in the northern Southwest.

In the southern Southwest, coarse braided sandals appeared in the Mogollon region around AD 700 or slightly earlier. By AD 1000, they were ubiquitous south of the Mogollon Rim, outnumbering all other sandal styles. As in the north, the earliest examples have square toes and heels, and later ones have rounded toes and heels, often subtly shaped for the right or left foot. Most are woven of wide yucca leaves in 1/1 or 2/1 diagonal interlacing, and have the elements folded up at the heel and anchored with a transverse strip of yucca (Figure 10). These Mogollon sandals somewhat resemble the coarsely braided ones from the northern Southwest, but are made with thicker leaves and have a different heel finish.

Around AD 1300, a new style of braided yucca sandal, this one finely plaited and equipped with an H-shaped woven strap, appeared in the southern Southwest. This style is

thought to be part of a widespread Salado sandal tradition related to the site of Paquimé (Casas Grandes) in northern Chihuahua, Mexico.

Despite their ubiquity at Mogollon and later Salado sites, braided sandals never achieved much importance in the Hohokam culture area of southern Arizona. There, coarse two-warp plain-weave sandals persisted from the Late Archaic period into late, pre-Hispanic times. People also wore a unique style of sandal shaped like a coiled braid (Figure 11). Made of yucca or agave fiber, these braidlike sandals appeared in southern Arizona around AD 800 and continued in use until about AD 1250–1300. Because of the poor preservation of textiles in the Hohokam region, most of these sandals are mineralized (petrified) or carbonized (charred) and difficult to analyze. The only unburned examples from southern Arizona come from Ventana Cave on the Tohono O'odham Reservation and Winchester Cave near Willcox. Their construction has been variously described as weft-wrapping (the site of Snaketown) and stitching on a matted fiber pad (Ventana Cave), but their technology is still open to question, and needs replication studies. In my opinion, most were probably made either by coiling a braided cord into the shape of a sole and then stitching the rows together, like Spanish espadrilles, or by twining the wefts in a spiral pattern over warps perpendicular to the long axis.

Archaeologists know a lot about Southwestern sandal styles, their construction, and how they changed through time, but they have barely scratched the surface in their understanding of sandal production and the social contexts in which sandals were used. If any Southwestern sandal tradition served a specialized purpose, it was probably the finely woven and ornate twined sandals of the Colorado Plateau. Their technological complexity and rich iconography raise a multitude of questions about who wove and wore them, whether certain villages specialized in their production, how and when people used this footwear, and what social messages they were intended to convey. All of these queries apply to other sandal styles, as well. These and many other intriguing questions invite future exploration. ■

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wide, which she holds in place with a pair of tweezers against the loose end of the thread and the main body of the moccasin, she picks up the business end of a precision hot air tool (made in Santa Fe by Steven Prins), and melts the BEVA strip onto the moccasin. “Do you know,” she asks, as she leans in to the work, “that there is nothing more intensely personal than working with these moccasins?”

“You can see the outlines of people’s toes, the shape of their feet in the leather,” Hunter says. She walks over, picks up a nearby moccasin, and points out the clear outline of its wearer’s foot.

Russell straightens up and holds the moccasin to the light, the thread solidly adhered to the hide, and the beads no longer in danger of rolling across the floor. “These are real things worn by real people.”

In addition to stabilizing beadwork, the conservators are using BEVA to repair tears in the heels and elsewhere in a number of pieces they’re working on for the show, and anywhere a little additional stability might be a good idea.

Sometimes, a use might not be so straightforward, as in the case where Hunter was faced with a porcupine quill moccasin that was missing quills in a few places. After doing some research and talking things over with her colleagues, Hunter landed on a novel approach to preparing the piece for exhibition. She took Tyvek, painted it to match the red of the adjacent quills, and then used BEVA to iron it onto the underlying hide. She also once used BEVA to re-attach leather to a tortoise shell shield.

Following news of Berger’s death, the conservator Boris Sternberg posted on his studio wall a memorial that found much resonance in the obituaries that followed: “God made Gustav, and Gustav made BEVA.” The sentiment, if not the exact words, captures a truism in conservation: success is one part tool, one part technique, and one part frustrated conservator who needs to solve a problem. ■

Peter BG Shoemaker writes about conservation for this magazine.