

The Color Symmetries of the Solstices: Ritual Sandals from the Prehistoric American Southwest

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Abstract

Between AD 400-700 incipient agriculturalists in the American Southwest wore yucca fiber sandals decorated with elaborate two-color plane pattern symmetrical designs. These designs, divided into two colored bands, each of which consisted of a pair of colors, that when combined, created two-color designs, were unprecedented in the Southwest. The color pairs mark the cardinal directions of the sunrises and sunsets at the summer and winter solstices used by corn agriculturalists to schedule their planting and harvesting activities. These designs are evidence that ritual beliefs and practices common in Mesoamerica accompanied the northward flow of migrants bringing corn agriculture into the American Southwest.

In the Southwest, as in Mesoamerica where it originated, those who live by the corn lifeway have developed a complex of rituals as well as farming practices to insure its success. Here we show how the color symmetries of the designs on Basketmaker III period yucca fiber sandals display ritual attention to the solar cycle critical to scheduling agricultural activities. We discovered that the pairing of colors on two-color symmetrical designs on these sandals references sunrise and sunset points of the summer and winter solstices. Ethnographic studies of beliefs about cardinal directions, color associations and paraphernalia used in maize rituals among contemporary peoples in Mesoamerica and the Southwest confirm this association.

In brief, the annual path of the sun and its two reversals at the winter and summer solstices are the celestial guides for scheduling agricultural activity. Pre-Columbian peoples tracked the seasons by observing the sun's path along the horizon at set observation points. At the summer solstice the sun is at its northernmost point on the horizon; at this time the young corn plants are thriving in the long, warm days. After the cobs mature and dry on the stalks they are harvested in the fall and stored in their husks. Then the fields are left to "sleep" until the sun changes direction at the winter solstice when the sun is at its southernmost point on the horizon. At this point people begin rituals to encourage the sun to move back north so that agricultural activity can begin again.

We claim that reference to these two directional changes in the sun's annual path is depicted on twined scalloped toed, puckered heel sandals found in the Four Corners area of the northern Southwest [1]. In contrast to most sandals during this period that were plain, four-warp serviceable affairs, this finely crafted footwear style was decorated with colored designs on the upper surface as well as plain wrapped designs on the sole [2]. We focus on the upper surface designs that are in two zones under the toe and instep areas of the foot when worn—a curious unseen display of ritually important concepts.

Here we describe how we used plane pattern symmetries [3] to analyze a large data set of these sandal designs composed of pairs of colored motifs in two bands that were juxtaposed to create two-color designs. We noticed that while the design motifs varied, 40% of the designs were organized by finite design symmetries $C2$, $D1$ and $D2$. In other cases motifs were repeated to form one-dimensional band designs, and a few were two-dimensional patterns as shown in schematic and actual examples in Figure 1.

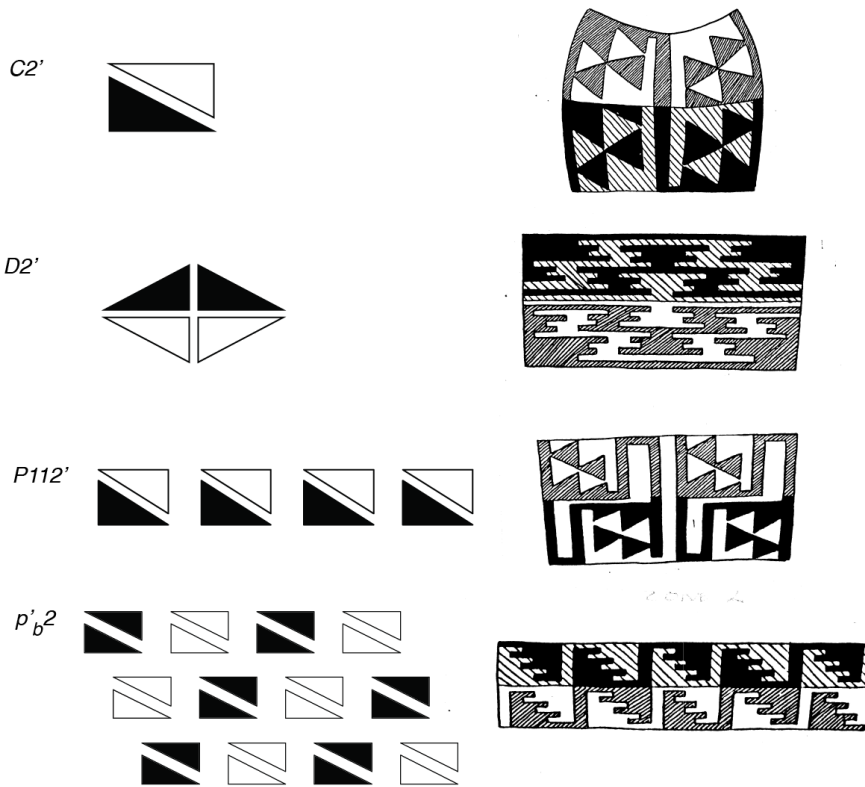


Figure 1 Two-color finite, one-dimensional and two-dimensional sandal designs.

Although four colors were used, these were not four color designs. Instead, the two-color symmetries were created by visually “superimposing” and then juxtaposing two bands of color over a single design. In each color band there is a pair of colors—one for the motif and one for the background. On these sandals the color pairs are red/yellow and black/white. Each color pair in a color band constitutes one half of the design (Figure 2). When the color bands are juxtaposed, a whole design is created that has two-color symmetry due to the alternation in colors of the color pairs (Figure 3 left).

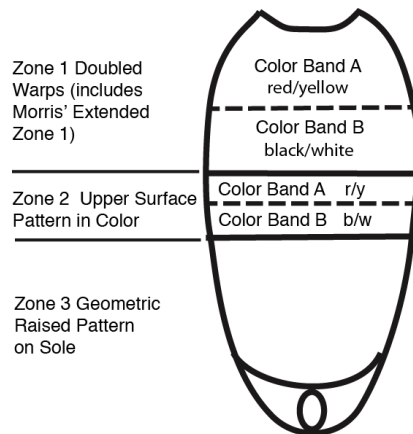


Figure 2 Color band arrangement in toe and instep areas on Basketmaker sandals.

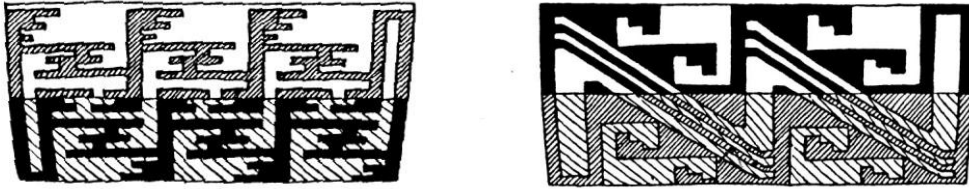


Figure 3 Left: Perfect $C2'$ symmetry design on a sandal from the Prayer Rock District, NE Arizona. The upper band has red motifs on a yellow background and the lower band has black motifs on a white background. Right: Imperfect $C2'$ design on a sandal from Broken Flute Cave, Prayer Rock District.

Sometimes the division of the motifs by the two color bands was not exact so that perfect superposition of the shapes in the upper band was not achieved. For example, in Figure 3 right, the division between the two bands in this $C2'$ design does not equally cut across the tips of the triangles. However, these “irregularities” are rare. What mattered was that the two color pairs appeared to be opposed in the two color bands, either in mirror reflection or bifold rotation, in order to create a two-color design. Figure 4 illustrates two sandals with these color bands in the instep and toe positions.



Figure 4 Left: $D2'$ symmetry in toe; $p112'$ in instep on sandal from Mummy Cave, Canyon De Chelly, New Mexico. Right: $p112'$ design on sandal instep from the Carriso-Lukachukai District, NE Arizona. Photos by Lynn Teague.

The significance of the color pairs on the design bands is embedded in the pairing of *diagonally opposite* directional colors. Among the beliefs surrounding maize farming in Middle and North America is the association of the cardinal directions with a specific color. Pueblo farmers in the American Southwest associate the northeast with white, southeast with red, southwest with blue/green, and northwest with yellow. Thus, as diagramed in Figure 5, the sandal color band with red motifs on a yellow background represents one half of the year between the rising sun at the winter solstice (red) and the setting sun at the summer solstice (yellow). In the other color band the black (? blue/green) motifs on a white background represent the other half of the year between the setting sun at the winter solstice (black) and the rising sun of the summer solstice (white).

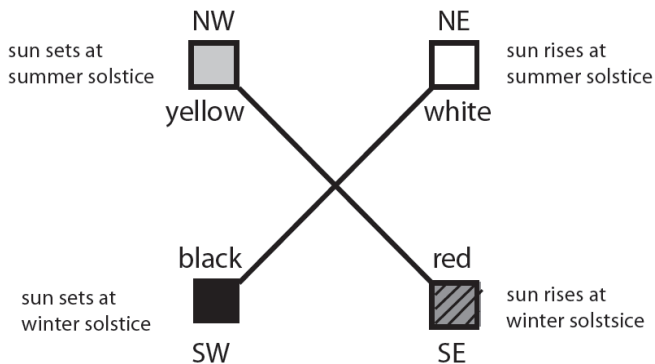


Figure 5 Schematic diagram of the correspondence of color and direction with solstice events.

Confirmation of these associations was documented by Alexander Stephen, an ethnographer who witnessed ritual practices among the Hopi of NE Arizona, descendants of the sandal makers whose linguistic kin live in Mexico. Even as late as the turn of the century, Stephen observed that the Hopi were decorating their altar paraphernalia with the same solstice oriented color scheme found on the sandals [4].

We note, finally, that not only do the $C2$ and $D2$ finite symmetries used to arrange the motifs colored by these color pairs represent the two parts of the solar year as bisected by the two solstices but they also visually state the reciprocities that exist at all levels of Pueblo life [5], from those between the interlocking life roles of husbands and wives to the complementary relationships between clans and ritual societies that have given direction and stability to these farming communities since the 5th century [6].

References

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