# LATE PREHISTORIC CERAMICS FROM AFTON CANYON (SBR-85) AND CRUCERO VALLEY (SBR-3572): INDIGENOUS OR INTRUSIVE?

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## ABSTRACT

Thirty-two late prehistoric ceramic samples were selected from the Afton Canyon and Crucero Valley sites for petrographic analysis, the purpose of which was to determine if the ceramics were indigenous, intrusive, or indeterminant. The mineralogical composition of the temper and the locally available source rocks allowed distinction between indigenous and intrusive ceramics. The results demonstrate that the majority of ceramics could have been locally produced. These conclusions indicate that the ceramic history of the Mojave Desert needs to be reexamined.

## INTRODUCTION

In the Mojave Desert region, it has often been assumed that distinctively different types of ceramics present in a site were the result of trading between groups who occupied different regions of the Southwest and made distinctive ceramics only in that area. What has not been adequately considered, for lack of appropriate data, is that the different styles of ceramics could have been locally produced, but the techniques imported. Application of petrographic techniques to thin sections of ceramic sherds and possible sourcing samples can determine whether different ware types were produced in only one area or whether the ceramics were locally produced and techniques were imported.

The research presented is a comparative petrographic analysis of late prehistoric ceramics from Afton Canyon and Crucero Valley on the lower Mojave River drainage system in the Mojave Desert, San Bernardino County (Figure 1). The major question addressed by this research is, do ceramic collections from these 2 sites represent indigenous Mojave Desert wares? Petrographic examination of a representative sample of ceramics from each site allowed identification of rock and mineral fragments in ceramic temper. These rock and mineral fragments were compared to those in sourcing thin sections taken from locally available Mojave Desert resources to determine whether the ceramics were locally made.

The purpose of this research was not to set up a typological system. It was to conduct a ceramic interpretation without resorting to ethnological analogies. Ceramic interpretation can provide the basis for understanding the relationship of ceramics to the environment and cultural groups producing them without predetermined ideas or social structural factors to bias the study (Arnold 1988:232).

Petrographic data allowed for the classification of the ceramic samples based on

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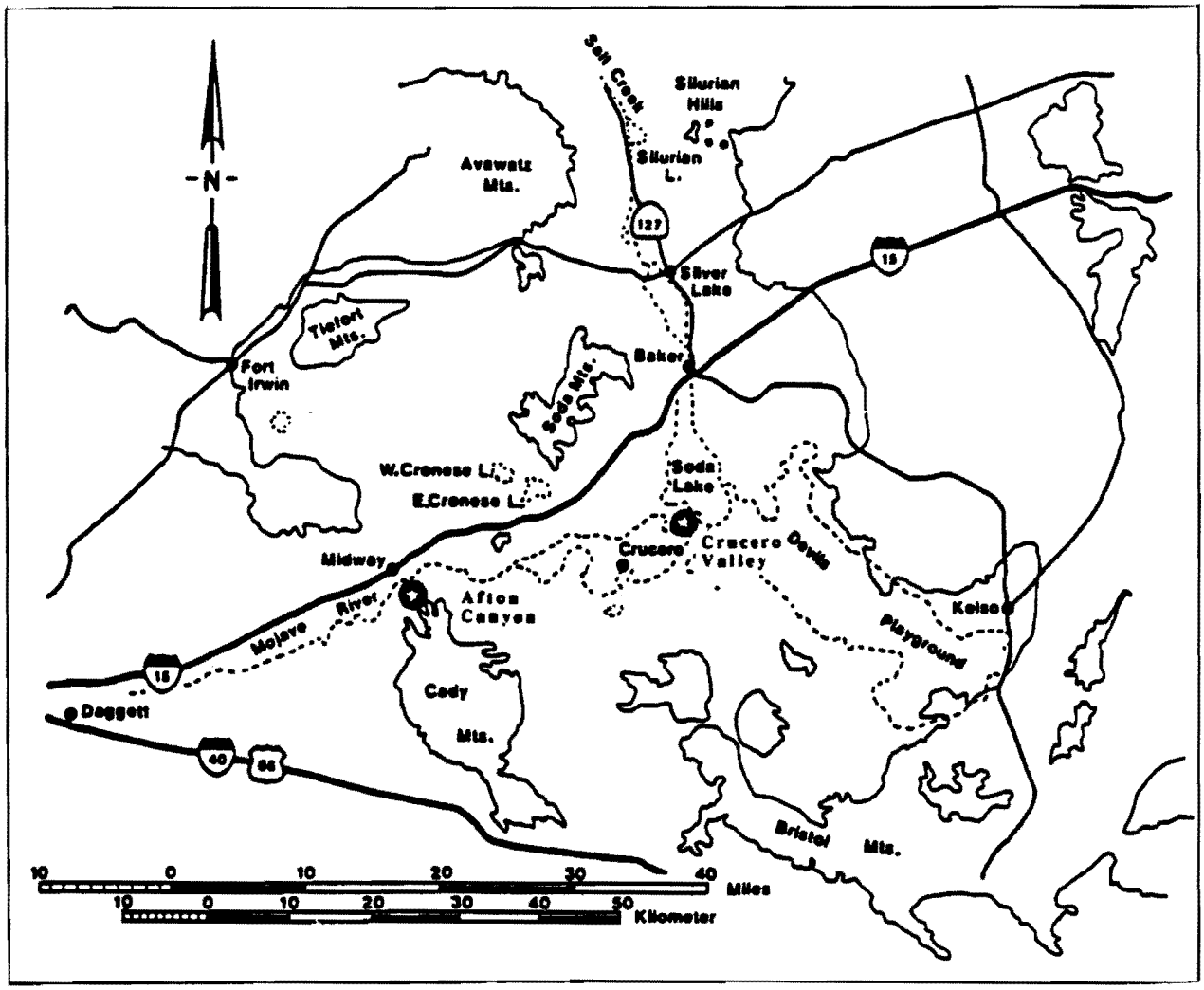


Figure 1. Afton Canyon and Crucero Valley site vicinity map.

rock fragments and mineral composition into indigenous, intrusive and indeterminant wares. Indigenous ware tempering material contains rock fragments and mineral grains common to rocks exposed in the Mojave Desert and contained in sourcing samples. Intrusive ware tempering material contains rock fragments and mineral grains not common in the Mojave Desert and not found in sourcing samples. Indeterminant ware tempering material contains rock fragments, mineral grains, and/or sherd fragments that could have been produced locally or imported but does not contain anything distinctive to assign a specific source.

Interpretation of petrographic data indicated that 19 ceramic fragments were locally produced; 5 ceramic fragments were intrusive; and 8 ceramic fragments were indeterminant although 7 of those could have been produced locally.

## ANALYTICAL METHODS

Ceramic Thin Section Sampling Criteria

A representative sample of ceramics from Afton Canyon and Crucero Valley was chosen for petrographic analysis.

The Afton Canyon prehistoric ceramic analysis was conducted by Dennis Jenkins (Schneider 1989). Sherds were chosen from this collection because this site is located in the Mojave Sink, near the Crucero Valley site. Jenkins typed this collection based on analysis using a binocular microscope at 20X magnification. Twenty-three sherds were recovered from Afton Canyon. Of these, 7 were selected for analysis because they appeared to represent buff and brown wares and 2 sherds represented 2 different published types, Verde Black-on-Gray and Needles Black-on-Red.

Five hundred and sixty-four sherds were collected from Crucero Valley. A fresh break was made in each sherd to clearly examine a cross section with a binocular microscope at 45X magnification. Twenty-five sherds were chosen for analysis. The sherds selected represent buff and brown wares and variations within each ware, based on a buff-brown ware dichotomy developed by Margaret Lyneis, who is currently conducting petrographic analysis in the Mojave Desert (Lyneis, personal communication, 1991).

Sourcing Thin Section Sampling Criteria

Selection of sourcing samples for petrographic analysis was based on 2 criteria: petrographic data from ceramic thin sections which resulted in possible source-rock types; and Dean Arnold's ethnographic data, in which he compiled geodesic distances to temper resources, which averaged 1 km or less, with the maximum range within 6-9 km (Arnold 1988:32-52).

A total of 9 sourcing samples were taken from appropriate rock types within a few km of the archaeological sites (Figures 2 and 3). The best match of ceramic temper to sourcing samples was obtained from sourcing samples collected from wash sand in the Mojave River drainage and drainages in the southern Soda Mountains.

Petrographic Analysis

Petrographic analysis of ceramic thin sections allowed for temper identification and classification based on rock fragments, mineral grains, and sherd fragments. A variety of rock fragments were found in ceramic thin sections: volcanic rock fragments (basaltic andesite, andesite to dacite, dacite to rhyolite, and volcanic glass), metaigneous rock fragments, metamorphic rock fragments (siltstone, quartzite, and fine-grained marble), and plutonic rock fragments. Some samples contained only individual mineral grains; a few contained only sherd fragments, 1 of which contained a red-slipped sherd fragment as temper.

Petrographic analysis of sourcing thin sections similarly allowed for identification of rock fragments and mineral grains. The purpose was to determine the similarity or dissimilarity of sourcing sample rock and mineral fragments to those in the ceramic temper. This similarity or dissimilarity was the basis for classifying the ceramics as indigenous, intrusive, or indeterminant wares.

## RESULTS

Based on the similarity of rock frag-

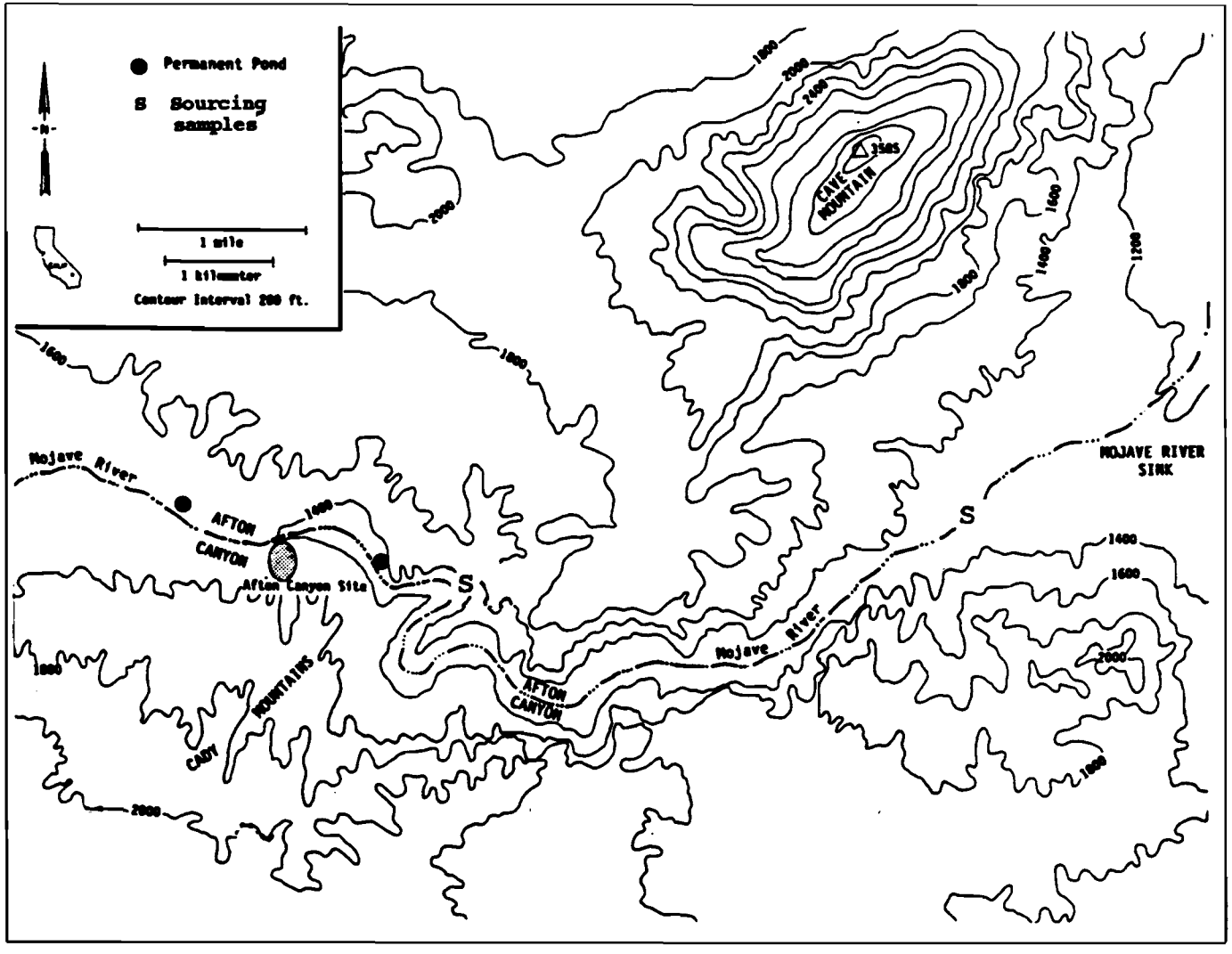


Figure 2. Afton Canyon sourcing map (adapted from Schneider 1989).

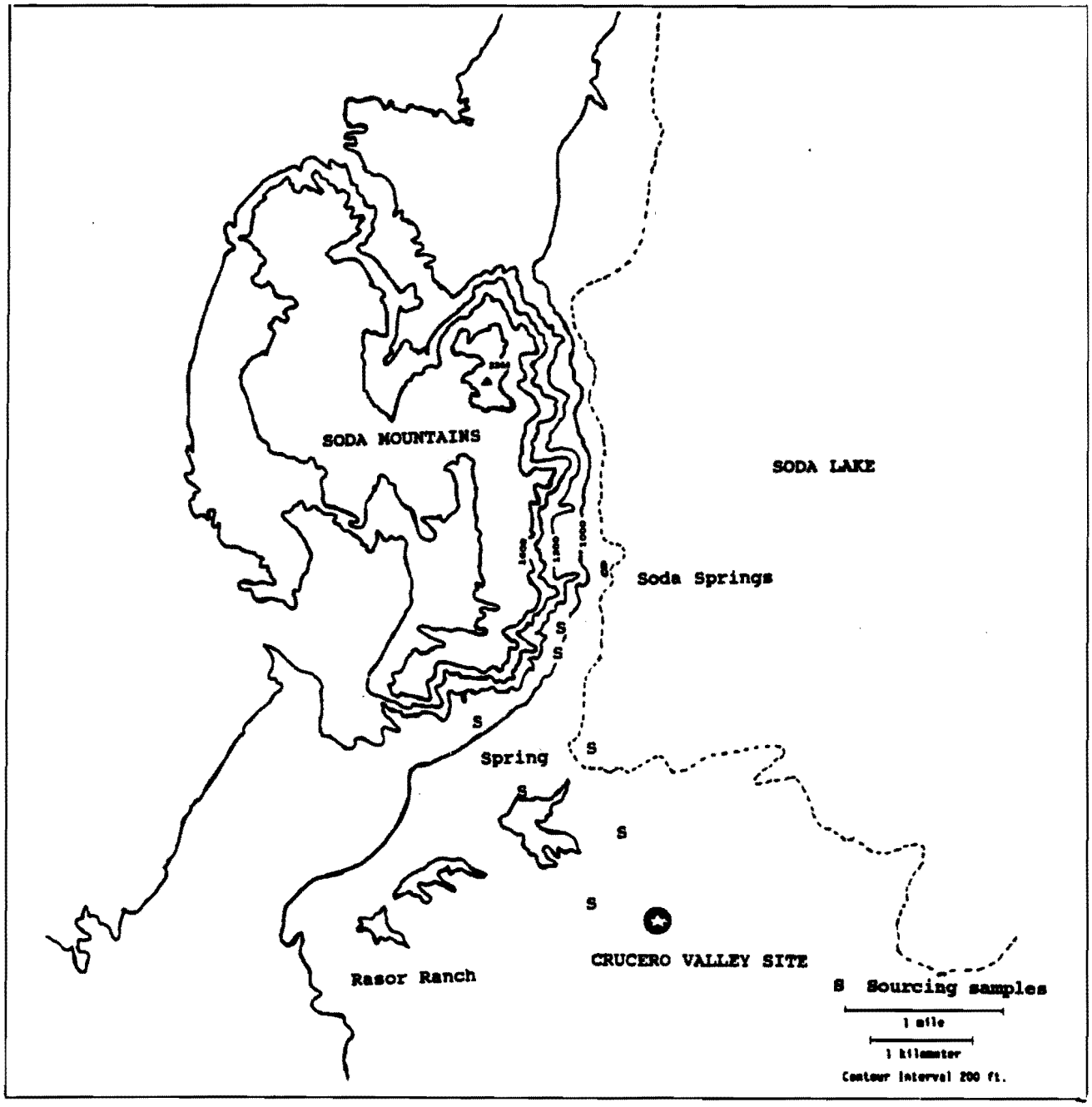


Figure 3. Crucero Valley sourcing map (adapted from U.S.G.S. Soda quadrangle).

ments in tempering material with rock fragments in sourcing samples, 19 samples were classified as indigenous. All 19 samples, representing a diversity of sherd textures, contain tempering material common in the Mojave Desert and found in sourcing samples from the Mojave River drainage and wash sand from the southern Soda Mountains.

Although petrographic comparison of temper and sourcing samples clearly indicates that the temper was locally derived, the exact source of the temper could not be made. Most indigenous wares contain temper grains of 2 or more types, volcanic (one or more compositional types), plutonic, metaigneous, and/or metamorphic. The mixture of different rock types as well as the occasional presence of rounded grains strongly indicates that the temper was derived from stream detritus. Indigenous wares contain temper grains that are texturally and mineralogically indistinguishable from grains in sourcing samples (hence the indigenous classification); however, the relative abundance of different rock types in the sherd and sourcing samples is not the same. The difference in relative rock abundances reflects the fact that the composition of stream detritus varies along its length because of input from tributary streams. The mismatch of relative rock abundances in sherd temper and sourcing samples simply indicates that the temper was collected from a different site than sourcing samples; however, the textural and mineralogical match of temper and sourcing samples indicates that they were derived from the same geologic source within the drainage basin of the stream.

Five samples are inferred to be imported, possibly from the Lower Colorado River region. Four samples contain the same metaigneous rock fragment temper. The source rock inferred from the rock fragments is a strongly foliated hornblende-biotite granodiorite. This source is most common around the Whipple and Chemehuevi Mountains and the Lower Colorado River area. Although there is a small outcrop of potentially similar rocks north of Barstow, it is more likely this ware was brought into Afton Canyon and Crucero Valley from the more extensive areas near the Colorado River. One sample is tempered mainly with metaigneous rock fragments that are inferred to be from a source rock of biotite-alkali-feldspar granite. This source is less common in the Mojave Desert but more common in the Lower Colorado River area and in Arizona.

There are 8 samples for which no determination of source rock can be made due to the presence of non-distinctive temper. These are classified as indeterminant wares. Of those 8, 7 samples contain tempering material that lacks distinctive rock fragments, contains no rock fragments at all, or contains rock fragments such as biotite-muscovite granite which are mineralogically common in the Mojave Desert as well as areas in the Lower Colorado River region and Arizona. One indeterminant sample temper is composed mainly of sherd tempering material and had nothing diagnostic as to source material, which could have been derived from any area.

## IMPLICATIONS

Ceramics have significant interrelationships with the environment and people producing them. Ceramic production is not universal; it reflects certain environmental and cultural factors. These factors include: availability of water and suitable clay and temper resources; a favorable climate for making ceramics; and the people's ability to stay in an environmental location long enough to produce, dry, and fire the ceramics (Arnold 1988:119).

The interrelationships of ceramics to the environment and cultural groups producing them can be studied using petrographic analysis. This type of analysis allows for the identification of the mineralogical composition of the ceramic tempering material. Through comparison of these data with the known local geology and sourcing samples, it is possible to determine whether the pottery was made at a site or not.

Ceramic classification typologies typically applied to ceramics found in the Mojave Desert have been based on binocular

microscopic analysis. This type of analysis lacks the precision necessary for detailed mineral identification and cannot clearly define the types of rocks being used for temper, nor whether the ceramics were produced at the site or not. Petrographic analysis of sherds and sourcing materials can establish a definitive relation between ceramics and locale of manufacturing.

The assumption made in previous ceramic studies that ceramic type is related to locale of manufacturing needs to be carefully reexamined. For example, a sherd typed as Verde Black-on-Gray was assumed to have been traded from the Southwest; however, the temper contains distinctive mineral grains with clay spots or fluid inclusions (brownish cast in thin section) on well-developed cleavage traces and fractures. This distinctive texture was also found in a sourcing sample from wash sand from the southern Soda Mountains suggesting that this sample of Verde Black-on-Gray could have been locally produced.

## CONCLUSIONS

Petrographic analysis can distinguish between indigenous, intrusive, and indeterminant wares, based on mineralogical similarity/dissimilarity of sherd temper and locally available rock types. In this study, 19 samples were classified as indigenous, 5 as intrusive, and 8 as indeterminant, although 7 of the latter could have been locally produced.

The importance of ceramic interpretation is not to pigeonhole the ceramics into typologies. Ceramic interpretation can show the interrelationship of ceramics to the environment, and cultural groups producing them, through petrographic analysis. The data in this study show that the majority of the ceramics were produced locally. The groups producing ceramics found that the Afton Canyon and Crucero Valley locations contained the materials necessary for producing pottery. The locations contained water, clay, temper resources, and a favorable climate for making pottery, and people were able to stay in these locations long enough to produce, dry, and fire the ceramics. Results of this study indicate this type of analysis must be done to establish a relationship of ceramics to locales before ethnological analogies are proposed.

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