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Author

Layton, Thomas N

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Invaders from the South? Archaeological Discontinuities in the Northwestern Great Basin

THOMAS N. LAYTON

IN 1972 this author published a series of hydration measurements on obsidian projectile points recovered during an archaeological excavation at Hanging Rock Shelter (NV-WA-1502) in northwestern Nevada (Layton 1972a). These data were used to temporally order a number of recognized Great Basin point types in the collection. In addition, the hydration results indicated possibly two episodes of occupational hiatus at the shelter. The earlier break was believed to have coincided with the onset of Altithermal climatic conditions (cf. Antevs 1953), while the later hiatus was thought to have occurred relatively late during the ensuing Medithermal climatic period. At the time of the hydration analysis, however, obsidian studies were largely in their infancy and the importance of geochemical and environmental variables had yet to be fully appreciated by most archaeologists. Moreover, the Hanging Rock Shelter sequence, spanning some 9,000 years, stood alone as the longest and most well-documented, site-specific obsidian hydration record in the general region. The only extant record of comparable length consisted of hydration measurements on obsidian artifacts from Cougar Mountain Cave (Layton 1972b), but this uncataloged assemblage, excavated and reported upon by an amateur archaeolo-

gist (Cowles 1960), lacks precise provenience documentation.

More recently, major excavations were conducted under the direction of the author at Last Supper Cave (NV-HU-102), located 32 km. northeast of Hanging Rock Shelter. As a consequence of these investigations, a 9,000-year obsidian hydration sequence is now available for the site. Among the objectives of this paper is a comparative evaluation of the hydration records from Hanging Rock Shelter and Last Supper Cave. Given advances since 1972 in the measurement of obsidian hydration bands, additional hydration measurements have been obtained for certain of the specimens from Hanging Rock Shelter. Hydration data from both sites collectively support the recognition of terminal Anathermal/early Altithermal and late Medithermal episodes of occupational hiatus and projectile point stylistic discontinuity in northwestern Nevada.

THE SITES

Hanging Rock Shelter and Last Supper Cave are situated in the heart of the High Rock Country of northwestern Nevada (Fig. 1). A tableland of vast, layered lava beds averaging 1,850 m. above sea level in elevation, the region is the most southerly extension of the Columbia Lava Plateau. Lava beds are warped, faulted, eroded, and often exposed as rimrock in canyon walls. Vegetation throughout the region can be generally de-

Thomas N. Layton, Dept. of Anthropology, San Jose State Univ., San Jose, CA 95192.



Fig. 1. Locations of Hanging Rock Shelter and Last Supper Cave, and other sites mentioned in text.

scribed as *Artemisia*-dominated Upper Sonoran Life Zone.

Hanging Rock Shelter was discovered in 1967 and excavated during the summer of 1968 (Layton 1970, 1972a). Lying 53 km. south of the Nevada-Oregon border and 45 km. east of the Nevada-California border, the site is located in a canyon formed by the downcutting of Hanging Rock Creek through a massive rhyolitic lava flow. Stream undercutting led to the formation of the shelter itself. The ground surface of the shelter is approximately 1,700 m. above sea level, and 4.5 m. above Hanging Rock Creek (at present, a perennial spring-fed stream). Given its southern exposure, the floor of the shelter receives some direct sunshine. The cultural deposits have a maximum depth of one meter and are seasonally wet from groundwater. Consequently, during the excavation only a

few perishable artifacts were found — primarily near the surface of the deposit. Human occupation of the shelter spans the last 9,000 years, terminating with an historic component (Layton 1973a). Three hundred seventy-eight typable projectile points, almost all of obsidian, were recovered from Hanging Rock Shelter.

Last Supper Cave was discovered, mapped, and tested during the summer of 1968 and completely excavated during the summers of 1973 and 1974. Initially exposed by the downcutting of Hell Creek through a faulted rhyolitic lava flow, the cave apparently owes its origin to the collapse and stream-removal of soft sediments underlying the flow. Situated at an elevation of 1,650 m., the cave is approximately 10 m. wide at the mouth and ca. 22 m. deep, with its walls converging towards the rear. The cave opens to the east, but its interior is nearly always shaded. Spring-fed Hell Creek, which flows only marginally in late summer, lies 20 m. below the floor of the cave. The stratified cultural deposits reach a maximum depth of 1.3 m., with the lowermost deposits seasonally wet from groundwater. Numerous perishable artifacts were found in the upper deposits and in nearby pack-rat nests. A series of radiocarbon dates indicate human occupation of the cave over the last 9,000 years with, as at Hanging Rock Shelter, a terminal historic component (Layton 1977a). Approximately 600 typable projectile points, again nearly all obsidian, were recovered from Last Supper Cave.

OBSIDIAN AND THE HIGH ROCK COUNTRY

Research in the past three decades has shown that the hydration of obsidian is controlled by at least three major variables: time, temperature, and chemical composition (cf. Friedman and Smith 1960; Friedman and Long 1976; Taylor 1976; Michels and Tsong

1980). In most cases, the specific temperature history of an obsidian tool over thousands of years is extremely difficult to ascertain. Varieties of preservation, including duration of ground-surface exposure, depth of burial, and climatic changes, all contribute to a highly variable temperature history. Likewise, the chemical composition of a particular obsidian tool and the chemistry of the soil in which it lies directly influence the rate of hydration in ways not yet fully understood. The absence of adequate controls over both the temperature history and chemical composition of archaeological obsidian in many published hydration studies has often led to anomalous results which, in turn, have forced extremely cautious applications of this dating method.

Fortuitously, the High Rock Country of northwestern Nevada is a region ideally suited for obsidian hydration dating since, for a number of reasons, some degree of control can be achieved over the temperature histories and chemical compositions of obsidian artifacts. First, obsidian occurs in abundance throughout the High Rock Country. Thus, local obsidian has been the primary tool material throughout prehistoric human occupancy of the region (over 95% of all excavated chipped-stone tools are made of obsidian). Second, obsidian trace-element characterization studies in northwestern Nevada are fairly advanced due to the efforts of Jack (1976), Erickson, Hagan, and Chesterman (1976), and Hughes (1983a, 1983b, 1985). Finally, numerous exogene rockshelters occur throughout the High Rock Country exposed at the basal edges of dissected lava flows. Many of these shelters contain multicomponent archaeological deposits featuring abundant obsidian tool assemblages presumably indicative of successive occupations over long periods of time. Obsidian artifacts protected from direct solar exposure in the shaded coolness and aggrading deposits of such shelters share a far less variable temper-

ature history than do obsidian artifacts found at open sites where hydration may proceed at accelerated rates because of higher effective temperatures (Layton 1973b).

THE DATA

The present study is based on hydration measurements for 126 obsidian projectile points from Hanging Rock Shelter and 121 obsidian points from Last Supper Cave. Both samples include most of the major point types known for the northern Great Basin. With the exception of Great Basin Stemmed series points (Layton 1979: 47; Tuohy and Layton 1977), the type designations used here follow the morphological key proposed by Thomas (1981a) for the central and western Great Basin.

Hydration values for the specimens from Hanging Rock Shelter were obtained by Paul Aiello at the University of California, Los Angeles, Obsidian Hydration Laboratory in 1970. Hydration on the Last Supper Cave specimens was measured in 1979 by Marvis Kelly, under the supervision of R. E. Taylor, at the University of California, Riverside, Obsidian Hydration Dating Laboratory. Originally, in an attempt to at least minimally control for geochemical variability, artifacts from both sites were candled and only those displaying a similar color and degree of translucency were selected for measurement. Subsequently, however, at the suggestion of Taylor (personal communication 1979), two apparent problems in the extant hydration data were addressed with additional, focused laboratory analysis. First, Taylor observed that in both sample sets there were a number of anomalous hydration measurements — particular points showed far more or far less hydration than did most of their typological counterparts whose hydration values were generally well clustered. Taylor suggested that the points displaying anomalous hydration values be “fingerprinted” by x-ray fluores-

Table 1
**OBSIDIAN SOURCES IDENTIFIED BY XRF ANALYSIS
 OF CERTAIN PROJECTILE POINTS FROM
 HANGING ROCK SHELTER AND LAST SUPPER CAVE**

Source	Number of Specimens		Totals
	Hanging Rock Shelter	Last Supper Cave	
Massacre Lake/Guano Valley	9	8	17
Home Camp A	1	1	2
Cowhead Lake	-	1	1
Badger Creek	1	-	1
Unknown	2	-	2
Totals	13	10	23

cence spectroscopy (XRF) to determine if obsidian source (i.e., geochemical) variability might account for the divergent hydration data. Therefore, 23 points previously measured for hydration (13 from Hanging Rock Shelter, 10 from Last Supper Cave) were selected for XRF analysis and obsidian source ascription.

Each of the 23 points was placed into one of three categories (unusually thin, unusually thick, or modal hydration) based on its hydration value relative to the measurements obtained on all other points of the same type from the same site. The XRF analysis was performed by Richard E. Hughes and Thomas L. Jackson at the Department of Geology and Geophysics, University of California, Berkeley, using procedures described in Hughes (1983a: 26-29, 1983b, 1985). Among the 23 points, Hughes and Jackson were able to identify four known, local obsidian sources and two unknown (but possibly local) sources. The results demonstrate source variation in the obsidian-point assemblages from both Hanging Rock Shelter and Last Supper Cave (Table 1). However, when thin, thick, and modal hydration values were compared against source assignments, there appeared to be no correlation between hydration rim thickness and obsidian source (Table 2). For example, of the 17 specimens ascribed to the Massacre Lake/Guano Valley source, five display hydration values categorized as unusually

thin and five display values categorized as unusually thick. Although admittedly an inadequate sample, the six remaining specimens, representing four different obsidian sources, also fail to show any apparent correlation between hydration value and source assignment. While it is certainly true that additional sourcing analysis should be pursued with respect to the Hanging Rock Shelter and Last Supper Cave projectile points, these results suggest that the anomalous hydration values are not necessarily a consequence of obsidian source variability, but could be attributable to post-depositional factors or to unrecognized properties of obsidian that can vary within a particular source.

The second major weakness recognized by Taylor in the original hydration study involved measurement instrumentation. In light of the large number of specimens from Last Supper Cave showing less than two microns of hydration, and given a 0.2-micron reading error using the standard optical measurement procedure, Taylor instituted a far more accurate photographic measurement technique developed and described by Findlow and DeAtley (1976: 166-167). The technique consists of photographing (35-mm. color slide) a hydration band at high magnification, photographing a stage micrometer at the same magnification, projecting the image onto a flat surface, and measuring the hydration band with a ruler calibrated to the projected

Table 2
**XRF OBSIDIAN SOURCE DETERMINATIONS FOR PROJECTILE POINTS
 FROM HANGING ROCK SHELTER AND LAST SUPPER CAVE
 DISPLAYING ANOMALOUS HYDRATION VALUES**

Source	Number of Specimens					
	Unusually Thin Hydration		Modal Hydration		Unusually Thick Hydration	
	Hanging Rock Shelter	Last Supper Cave	Hanging Rock Shelter	Last Supper Cave	Hanging Rock Shelter	Last Supper Cave
Masacre Lake/Guano Valley	2	3	5	2	2	3
Home Camp A	1	—	—	1	—	—
Cowhead Lake	—	—	—	1	—	—
Badger Creek	—	—	1	—	—	—
Unknown	1	—	—	—	1	—
Totals	4	3	6	4	3	3

image of the micrometer. Measurements are taken at a large number of loci along the band, and then averaged. With this approach, the reading error is reduced to less than 0.05 microns. Under Taylor's supervision, thin sections of specimens (from both Last Supper Cave and Hanging Rock Shelter) displaying less than two microns of hydration were photographed and hydration bands measured using the technique described above.

A final analytical problem with respect to the hydration data from Hanging Rock Shelter and Last Supper Cave was the significant number of demonstrably old projectile points lacking visible hydration — despite additional thin-section removal, preparation, and examination. The question here was whether hydration was actually absent or simply invisible. Six Northern Side-notch points from the Last Supper Cave collection with apparently no visible hydration were sent to Joseph Michels at the Pennsylvania State University Obsidian Laboratory. On one specimen, Michels and his associates determined that hydration was indeed present by preparing a depth profile of hydrogen concentration by means of secondary ion mass spectrometry. With the existence of a hydration band thus demonstrated, by manipulating the lighting system Michels was able to optically measure hydration on the remaining five points. The resultant hydration values are comparable to those previously

obtained on other Northern Side-notch points from the two sites. Michels also was able to secure band measurements on 41 additional points that initially appeared to lack visible hydration. The problem of "invisible hydration" and its resolution are discussed by Michels, Marean, and Tsong (1981: 3-4).

ANALYSIS

Obsidian hydration measurements for projectile points from Last Supper Cave and Hanging Rock Shelter, respectively, are graphically arrayed, by point type, in Figures 2 and 3. The two hydration records are combined in Figure 4. Several revisions have been made to the data originally reported for Hanging Rock Shelter (Layton 1972a) in order to facilitate comparison with the data from Last Supper Cave. These include appropriate changes to point type nomenclature, deletion of hydration measurements on a small number of uncommon point types, and inclusion of replacement measurements on a few specimens that originally displayed somewhat anomalous hydration values.

Three patterns are evident in the distributions of hydration measurements in Figures 2 and 3. First, there is, in general, a sequential pattern in which types gradually supplant each other, but with broad temporal overlap. Thus, for example, Gatecliff Split-stem points are gradually supplanted by Elko Eared

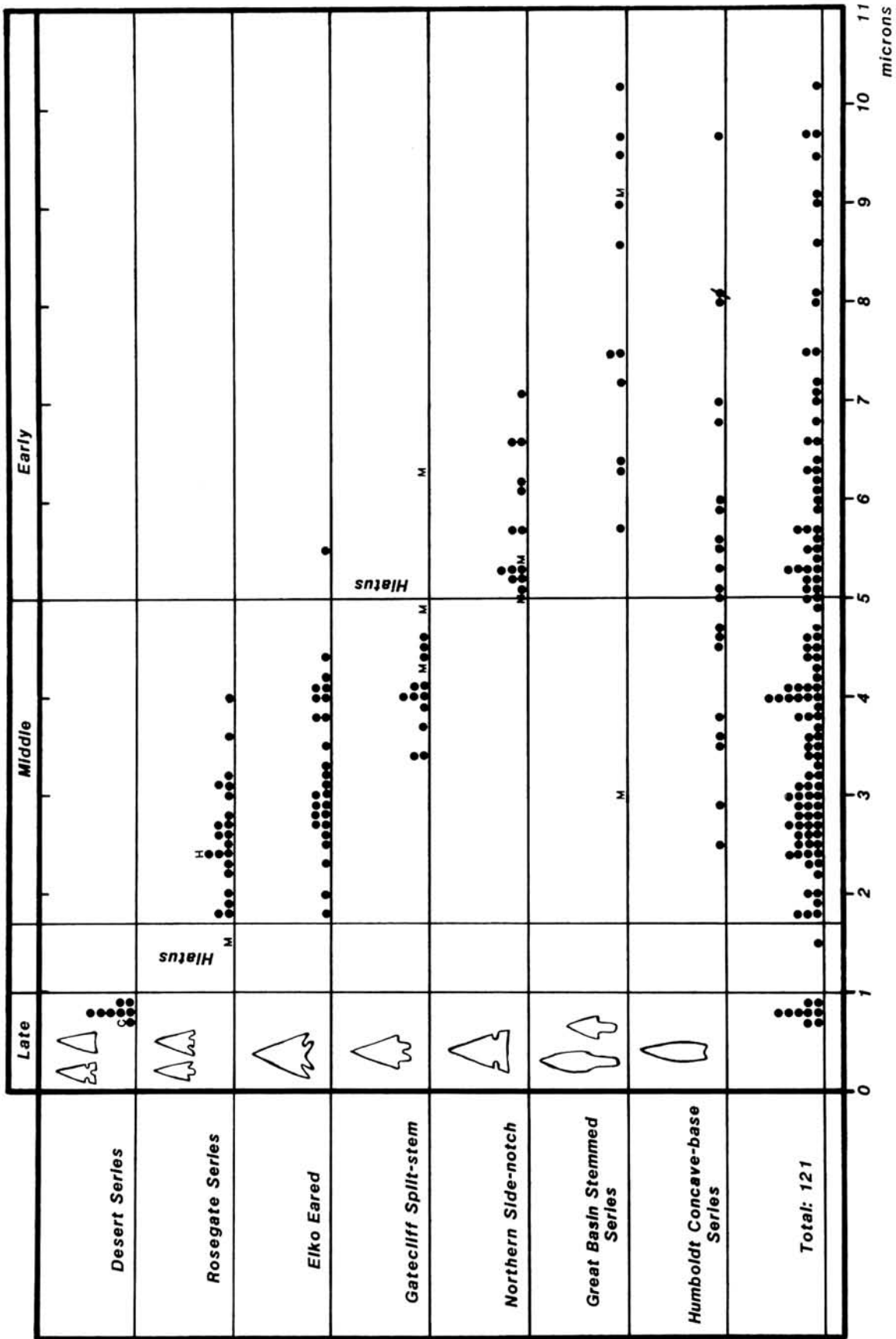


Fig. 2. Hydration measurements on 121 obsidian projectile points from Last Supper Cave; letters indicate specimen source assignments based on XRF analysis (M – Massacre Lake/Guano Valley, H – Home Camp A, C – Cowhead Lake); slashed dot represents Humboldt Concave-base-series point possibly classifiable as Black Rock Concave-base point (Clewlow 1968).

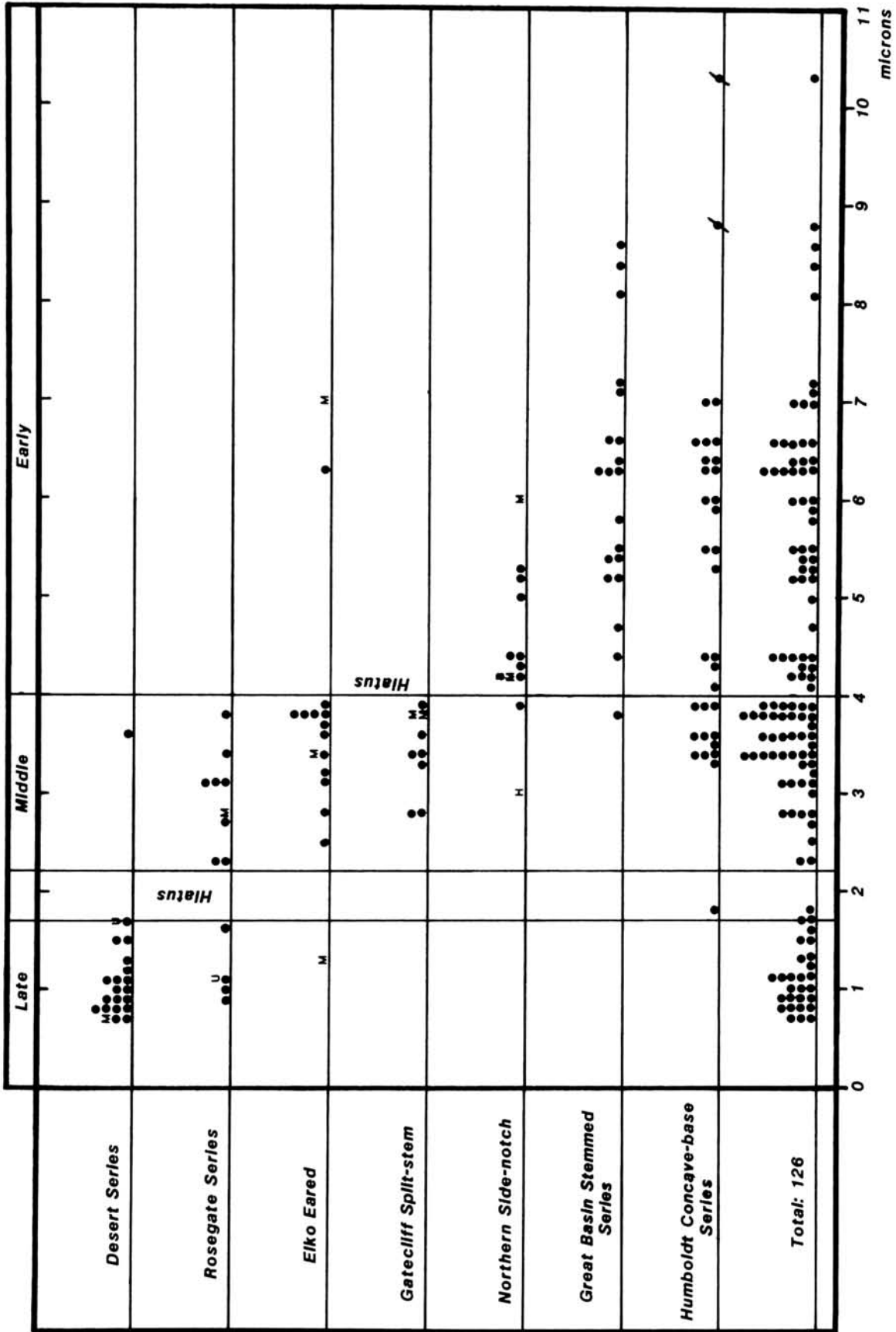


Fig. 3. Hydration measurements on 126 obsidian projectile points from Hanging Rock Shelter; letters indicate specimen source assignments based on XRF analysis (M – Massacre Lake/Guano Valley, H – Home Camp A, B – Badger Creek, U – unknown); slashed dots represent Humboldt Concave-base series points possibly classifiable as Black Rock Concave-base points (Clewlow 1968).

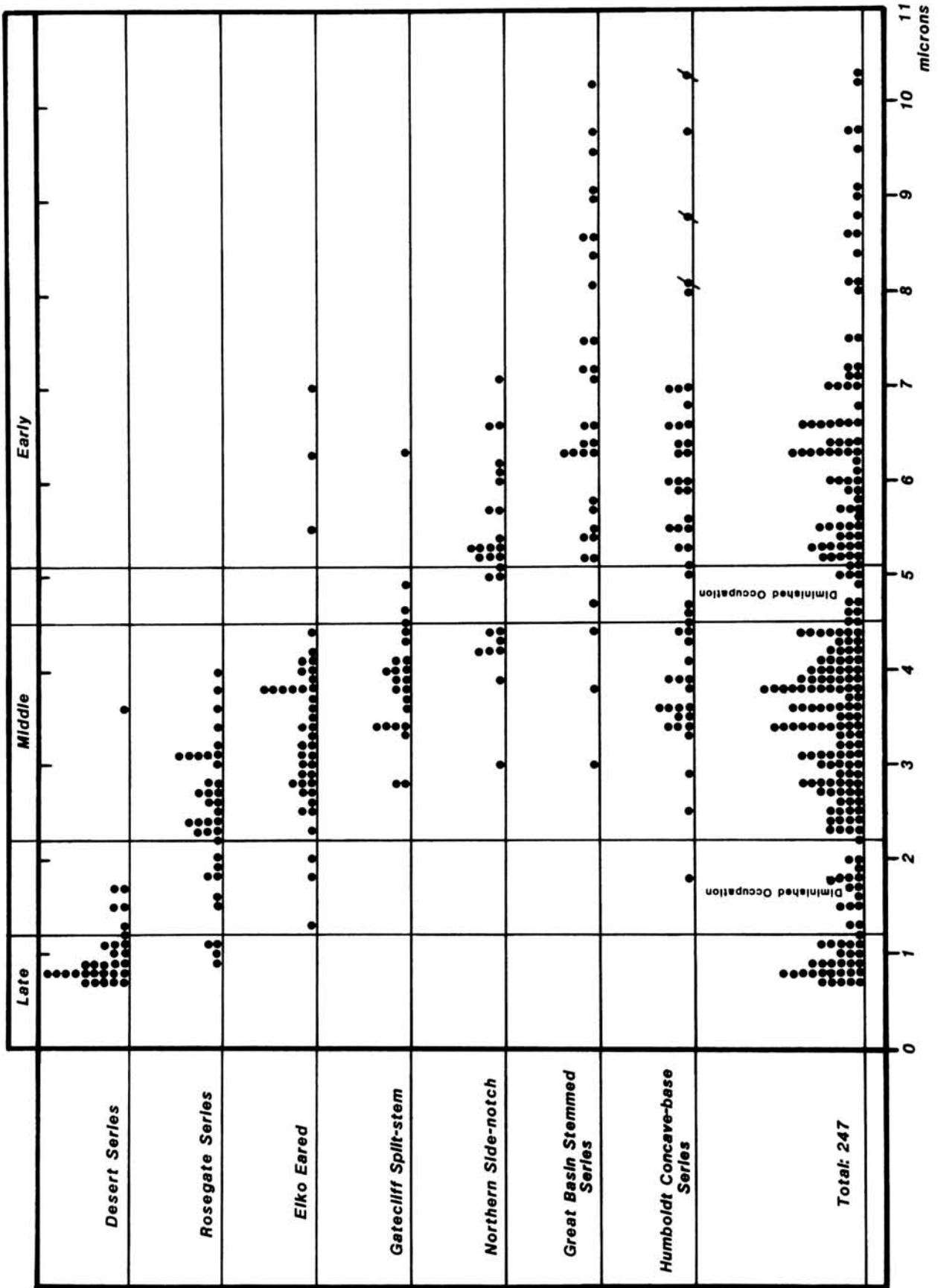


Fig. 4. Combined hydration measurements from Hanging Rock Shelter and Last Supper Cave; slashed dots represent Humboldt Concave-base-series points possibly classifiable as Black Rock Concave-base points (Clewlow 1968).

points. Most of the point types considered in this study overlap through time in such a manner. Second, and equally clear, there is a pattern wherein point types supplant each other without significant temporal overlap. In this way, the Northern Side-notch type, common in the Columbia Plateau, is supplanted by the Gatecliff Split-stem type, common in the central Great Basin. The impression given here is one of a cultural discontinuity in which a stylistically distinct projectile point form of northern affinity is supplanted, without temporal overlap, by a stylistically distinct and unrelated form of southern affinity.

The third pattern is that at both sites there are two periods of analogous occupational hiatus that can be recognized in the plotted hydration measurements. The earlier hiatus at both sites immediately follows the hydration flourish for Great Basin Stemmed and Northern Side-notch points and predates the appearance of Gatecliff Split-stem points. The later hiatus is represented by an apparent abandonment of both sites just prior to the appearance of Desert series projectile points. Although the inter-site patterning of these two periods of hiatus is analogous, they are not synchronous. For example, the Northern Side-notch/Gatecliff Split-stem hiatus occurs earliest at Last Supper Cave and almost a micron later at Hanging Rock Shelter. Conversely, abandonment just prior to the appearance of Desert series points occurs first at Hanging Rock Shelter and almost half-a-micron later at Last Supper Cave. That these parallel breaks in continuity appear asynchronous cannot be explained by positing differing rates of hydration for the two sites, for were this the case, their relative ordering would remain the same rather than undergo the reversal seen here. What each asynchronous hiatus may reflect is the slow, irregular replacement of one hunting and gathering population by a second, first at one site and then later at the other.

A fourth pattern can be recognized when the Hanging Rock Shelter and Last Supper Cave obsidian hydration measurements are plotted together (Fig. 4). When this is done, fine distinctions become fuzzy. Clean temporal breaks between Northern Side-notch and Gatecliff Split-stem points are lost, and the evidence of a late period abandonment of both sites becomes far less dramatic. What the combined plot does suggest, however, are increases and decreases in occupational intensity. The Northern Side-notch/Gatecliff Split-stem projectile point discontinuity clearly correlates with a decrease in the frequency of obsidian hydration measurements between 4.5 and 5.1 microns, as does the hiatus (1.2-2.2 microns) before the appearance of Desert series points.

The earlier decrease in occupational intensity is probably related to the Altithermal and possibly to the Mazama ashfall. Approximately 1.5 km. from Last Supper Cave, a bed of Mazama ash 30 cm. thick, dated by radiocarbon assay to $6,710 \pm 110$ B.P. (Tx-2597), is exposed in an arroyo wall. Within Last Supper Cave, stratigraphic evidence of a decrease in and eventual disappearance of roof drip, a major decrease in the abundance and size of rockfall in the talus facies, the disappearance of *Margaritifera* (a local stream-dwelling mussel), and decreased occupational intensity, based on chipped stone and bone weights per volume of midden, document the arrival of a warm, dry climatic regime and illustrate some of its consequences. The more recent decrease in occupational intensity may be related to climatic change as well. Stratigraphic evidence from Last Supper Cave (Davis 1974) demonstrates a major decrease in the size of roof fall postdating a radiocarbon date of $1,490 \pm 50$ B.P. (Tx-2857). The warm, dry period inferred from this dated stratigraphic change fits well with the abandonment of the site suggested by the hydration data.

The plotted obsidian hydration measurements from Last Supper Cave and Hanging Rock Shelter permit subdivision of the chronological record into three periods of occupation, punctuated by two periods of discontinuity. The Early Period is characterized by the hydration floruit for Great Basin Stemmed and Northern Side-notch points. It ends with a period of diminished occupation and a break in stylistic continuity. The following Middle Period is one of major occupations, and features the successive and overlapping hydration floruits for Gatecliff Split-stem, Elko Eared, and Rosegate series points. The Middle Period ends with the asynchronous abandonments of Last Supper Cave and Hanging Rock Shelter. The only point types that span the Early/Middle break are those of the generalized Humboldt series, which have a long history in both the Basin and Plateau and do not seem to be time-sensitive (see Thomas 1981a: 37). The obsidian hydration data from Hanging Rock Shelter and Last Supper Cave thus support the hypothesis that two periods of prehistoric cultural disruption occurred in the High Rock Country.

EARLY DISCONTINUITY: BASIN-PLATEAU DEMOGRAPHIC SHIFTS

Northern Side-notch projectile points (Gruhn 1961) have their main distribution in a broad arc around the northern periphery of the Great Basin. This broad arc, drawn from northwestern Utah, into Idaho, west across the Columbia Plateau, and south into California as far as Honey Lake circumscribes the Basin-and-Range province. Along this arc distinctive, large side-notch projectile points have been recognized and variously named Bitterroot Side-notch in Idaho (Butler 1962), Cold Springs Side-notch in the Columbia Plateau (Butler 1961), and Madeline Dunes Side-notch in northeastern California (Riddell

1960: 18). For terminological parsimony, all of these are herein subsumed under the Northern Side-notch designation after Gruhn (1961: 129). Northern Side-notch points seem to occur earliest in Idaho where they are present by 6200 B.C. and abundant by 5200 B.C. (Swanson 1972: 110). Throughout the Columbia Plateau they first appear immediately after the Mazama ashfall (Leonhardy and Rice 1970), and they are used to define the later Cascade Sub-phase (ca. 5000-3000 B.C.). Swanson (1972: 111) argued that these points "appear to slope upwards in time away from the northern Rocky Mountains in a wide arc to the west."

Within the Great Basin, Northern Side-notch projectile points rarely occur south of the High Rock Country and the Black Rock Desert. Crossing the central Great Basin from west to east, they are almost totally absent at the Humboldt Lakebed site (Heizer and Clewlow 1968), at Wagon Jack Shelter (Heizer and Baumhoff 1961), in the Reese River Valley (D. H. Thomas, personal communication 1981), and at South Fork Shelter (Heizer, Baumhoff, and Clewlow 1968). The Northern Side-notch projectile point is thus part of a northern tradition centered in the Columbia Plateau.

Gatecliff Split-stem points, on the other hand, are part of a separate and independent stylistic tradition typifying the central and southern Great Basin where they are variously designated as Little Lake series or Pinto points. Recently Thomas (1981a: 33) has merged these related forms as Gatecliff Split-stem. This designation will be used in the present discussion. There is no stylistic continuity between Northern Side-notch and Gatecliff Split-stem projectile points, nor is there temporal overlap in the plotted hydration measurements of these immediately sequential types at either Hanging Rock Shelter or Last Supper Cave. Moreover, since the rate of obsidian hydration is known to de-

crease with each additional increment, artifacts with moderate amounts of hydration appear telescoped together in time when plotted. In spite of this telescoping tendency, the plotted hydration measurements of Northern Side-notch and Gatecliff Split-stem projectile points remain in discretely separable clusters.

Independent support for a Northern Side-notch/Gatecliff Split-stem developmental hiatus in the High Rock Country comes from the Silent Snake Springs site (Layton 1970; Layton and Thomas 1979). Silent Snake Springs has a major Gatecliff Split-stem component dating from 4050 B.C. (3350 ± 380 B.C., WSU-994 [corrected]). Although Northern Side-notch projectile points occur on the surface throughout the general area of Silent Snake Springs, of the 73 typable points recovered from the site at least 50 are either Gatecliff Split-stem or Elko Eared forms, while only three can be classified as Northern Side-notch. This suggests that the Gatecliff Split-stem occupation at Silent Snake Springs is neatly outside of the settlement pattern of the preceding manufacturers of Northern Side-notch projectile points. As hydration measurements from Last Supper Cave and Hanging Rock Shelter show, the Gatecliff Split-stem/Elko Eared stylistic tradition abruptly followed the Northern Side-notch tradition without overlap or much delay. The 4050 B.C. date for the basal Gatecliff Split-stem occupation at Silent Snake Springs suggests that a break in cultural continuity occurred ca. 4500 - 4100 B.C.

This hiatus in the High Rock Country and its dating are supported by evidence from Surprise Valley, California, 65 km. west of Silent Snake Springs. In Surprise Valley, O'Connell (1975: 53) perceived a similar break in cultural continuity between the Menlo phase (4400-4000 B.C.), characterized by earth lodges and Northern Side-notch points, and the subsequent Bare Creek phase,

characterized by brush-and-pole structures and Gatecliff Split-stem points, dated to sometime after 4000 B.C. but before 1000 B.C. O'Connell (1975: 57) argued that this change in domestic architecture and a concurrent break in the stylistic continuity of associated artifacts may indicate a population replacement in which central Great Basin groups expanded into Surprise Valley bringing with them the Bare Creek phase configuration. He observed that Menlo Phase earth lodges and associated artifacts are most similar to assemblages assigned to the Cold Springs Horizon (Warren 1968) in the Columbia Plateau. He tentatively suggested that this hypothesized demographic shift in Surprise Valley was related to environmental change. The introduction of coiled basketry into the northwestern Great Basin about this time (Adovasio and Fry 1972: 69) may likewise be related to population movements out of the central Great Basin. If, in fact, a population replacement by emigrants from the central Great Basin did occur in Surprise Valley and the High Rock Country, it seems likely that Northern Side-notch points would have continued to be manufactured further to the west in areas not directly affected by the demographic shift.

In sum, the evidence from the High Rock Country and Surprise Valley clearly suggests a break in cultural continuity in the northwestern Great Basin ca. 4500-4000 B.C. in which peoples with cultural ties to the central Great Basin replaced peoples with cultural ties to the Columbia Plateau.

LATE DISCONTINUITY: THE NUMIC ARRIVAL AND LATE MEDITHERMAL SETTLEMENT SHIFTS

Obsidian hydration measurements from Hanging Rock Shelter and Last Supper Cave clearly demonstrate a late Medithermal abandonment of these two sites. This does not necessarily mean an abandonment of the High

Rock Country, but it does indicate a settlement pattern change in which these two upland exogene rockshelters were abandoned – Hanging Rock Shelter first, followed by Last Supper Cave. Equally of interest is that Desert series projectile points clearly postdate this abandonment at both sites. These facts may be relevant to an understanding of the Numic spread. In the following arguments, however, it must be remembered that there is no reason to assume that the High Rock Country contained all of a settlement pattern, nor that these two sites are “typical,” “normative,” or “modal” representations of an entire system (D. H. Thomas, personal communication 1983).

For many years dialect geography and glottochronology (Lamb 1958) have provided the major basis for an inferred post-A.D. 1000 spread of Numic-speaking groups into the Great Basin from a southeastern California homeland. Until recently, archaeological evidence for such a spread has been difficult to muster, but recent research (Thomas 1981b; Bettinger and Baumhoff 1982; Butler 1981) has considerably strengthened the Lamb model.

Excavations by David H. Thomas at Alta Toquima Village, situated at an elevation of 3,400 m. on Mount Jefferson in central Nevada, have produced evidence of a settlement pattern shift ca. A.D. 1000. Thomas (1981b: 112-113) wrote of “an early hunting-oriented complex,” lacking seed-grinding stones and reflecting use of the highlands by all-male hunting bands operating out of valley base camps. Subsequently, during the Yankee Blade phase, Thomas found that there was a dramatic cessation of communal hunting and the establishment of a residential village with numerous associated seed-grinding implements and ceramics. Thomas noted that of the 279 diagnostic projectile points collected in a 1,450-ha. survey of non-village hunting territory, 98% were of the Rosegate series and

earlier types, whereas more than 50% of the 435 diagnostic points associated with the Alta Toquima Village were of the Desert series. At Alta Toquima, Thomas’ small, Yankee Blade-phase village overlies strata containing remains of the more extensive, early hunting complex. Thomas (1981b: 113) summarized: “It is premature to speculate about the causes of this settlement pattern shift. Clearly it could be related to the so-called Numic expansion which occurred at about this time.”

Recent high-altitude surveys and excavations directed by Robert L. Bettinger in the White Mountains bordering Owens Valley in southeastern California have produced evidence of a shift in adaptive strategy analogous to that recognized by Thomas at Alta Toquima. Bettinger (personal communication 1983) recognized a cessation of long-distance hunting and a shift to more intensive pinyon exploitation ca. A.D. 600. He noted that this shift coincides with a period of major temperature oscillations inferred from tree-ring widths. Bettinger’s excavation of a large house containing both Rosegate and Desert series points at the Crooked Forks site, above 3,400 m. elevation, allowed him to tentatively suggest that this shift occurred several hundred years earlier in southeastern California than it did in central Nevada (*see also Bettinger and Oglesby [1985], this issue. Ed.*).

These high-altitude adaptive shifts from hunting to gathering, occurring sequentially from south to north, fit well with Lamb’s (1958) model of a Numic spread north and east out of southeast California into the Great Basin. In this regard, recent work by B. Robert Butler (1981) in southern Idaho is relevant to the direction and the duration of the Numic spread. Butler has reanalyzed a number of late archaeological assemblages and has concluded that there is no evidence of Numic-speaking people in southern Idaho prior to the 16th Century. He argued that the “Lemhi phase may actually have begun no earlier than

A.D. 1800 (and) it is the only phase that can be attributed to the northern Shoshone in the Birch Creek Valley" (1981: 15).

Recently, Bettinger and Baumhoff (1982) attempted to explain the Numic spread in processual terms. The problem has always been to explain how one group of hunters and gatherers can displace another when neither displays any intrinsic technological or numerical superiority. Bettinger and Baumhoff argued forcefully that this kind of displacement can occur by virtue of competitive advantages or disadvantages inherent in particular adaptive strategies. They contrasted hypothesized pre-Numic "travelers," practicing a low-cost, male-oriented, large-game-hunting strategy, with Numic "processors" practicing a more female-oriented, high-cost, seed-harvesting strategy. They ascribed most Great Basin rock art to the pre-Numic period as hunting magic and identified certain specialized seed-processing implements (twined, paddle-shaped seed beaters and deep-twined, triangular winnowing trays) as Numic-related.

The Bettinger-Baumhoff model clearly explains in broad theoretical terms how a Numic expansion could have occurred at the expense of pre-Numic peoples. Their argument also seems to fit the available archaeological and linguistic data. They have been careful, however, to avoid basing any portion of their argument on environmental data, thus avoiding the charge of crass environmental determinism. Perhaps they have been too timid in this respect. Bettinger (personal communication 1983) recognized major climatic oscillations ca. A.D. 600 concurrent with the shift from a traveling to a processing strategy in southeastern California. Moreover, the possibility that whole family units were moving up to elevations of more than 3,400 m. in both southeastern California and central Nevada provides at least circumstantial evidence of an inadequacy of seed resources at lower elevations.

Dated tree stumps from Osgood Swamp near Lake Tahoe suggest a major warm, dry interval from A.D. 800 to 1050 (Sercelj and Adam 1975; Hattori 1982: 33). The stratigraphic shift from large to small roof fall in the talus facies at Last Supper Cave after A.D. 460 may indicate a decrease in freeze-thaw activity and, likewise, the onset of warmer, drier climate. Additionally, the late-period abandonments of both Hanging Rock Shelter and Last Supper Cave noted above support the idea that a major settlement pattern shift took place, and excluded these once attractive localities from the seasonal round. Regrettably, large-scale settlement pattern studies of the kind accomplished by Bettinger in southeastern California and Thomas in central Nevada have not been done in the High Rock Country. Thus, at present, it is impossible to show where in the High Rock Country people were living during this period, or alternatively, to demonstrate that the area was, in fact, abandoned.

The important issue here, however, is that the hypothesized Numic expansion seems to have occurred in concert with a period of climatic fluctuations. Bettinger and Baumhoff (1982) suggested that Numic groups may have enjoyed a competitive, organizationally derived advantage that facilitated their expansion into territories simultaneously occupied by non-Numic groups. But it remains to be determined whether the former displaced and/or absorbed the latter, or whether Numic groups simply moved into areas left vacant by a diminishing pre-Numic population. Specifically, climatically induced environmental changes may have forced pre-Numic abandonment of areas later settled by Numic populations. The evidence from Hanging Rock Shelter and Last Supper Cave may indicate that these sites had been abandoned for a substantial period of time before being reoccupied by the presumably Numic-speaking manufacturers of Desert series projectile points.

Bettinger and Baumhoff (1982) provided an elegant model for population replacement which, as they recognized, must be tested against the varied regional aspects of the Numic expansion. In this regard, it is particularly important to consider the possibility of significant population reduction, on local, areal, or regional levels, prior to the arrival of Numic groups. Although the physical nature of the Great Basin archaeological record is such that it tends to inhibit delineation of periods of severely diminished land use or outright abandonment, obsidian hydration dating, applied where possible on a massive scale, may prove quite effective in diachronically monitoring occupational intensities.

Finally, in a recent paper, Mark Q. Sutton (1985) presented compelling ethnohistoric evidence that the Numic expansion continued well into the 19th Century. Sutton observed that Numic groups were militarily aggressive, and although they rarely fought among themselves, they were at war with virtually all of their neighbors. According to Sutton (1985), Numic groups "consistently applied force and were only halted or pushed back by coalitions of greater size and/or better weapons (e.g., guns)" and, further, he argued that "since the use of force was so important in late expansions, it was probably an important factor in the replacement of pre-Numic peoples throughout the Great Basin over the past millennium." It seems apparent that a full explanation of the Numic spread must focus on the subtle and variable interplay of both cultural and environmental factors.

BUILDING PREHISTORIC ETHNOLINGUISTIC BOUNDARIES

The 19th-Century linguistic picture in the Great Basin was a simple one, with most of the region occupied by peoples speaking languages assigned to the Numic language family of the Uto-Aztecan linguistic stock. The geographic distribution of languages in

western North America, however, was anything but simple, and a parsimonious explanation of this linguistic mosaic has provided a standing challenge for several generations of linguists. Their historical reconstructions, generally involving population movements into or out of the Great Basin, have made it an arena for an ever-changing choreography of linguistic gymnastics. Most reconstructions have been based on dialect geography, glottochronology, and liberal doses of hocus-pocus (Goss 1977: 50). Archaeological input has generally been minimal. The problem here has been one of linking linguistic groups with archaeological complexes, for, as Boas long ago demonstrated and Fowler (1977: 7) reminded us, race, language, and culture vary independently.

During the past ten years major advances in the development and refinement of regional chronologies in the Great Basin and the Columbia Plateau have occurred, and it has become apparent that certain widespread, stylistically distinct artifact types possess restricted temporal and geographic distributions. These artifacts consist primarily of projectile points, for they are the only stylistically distinctive common denominator of all Great Basin sites. If, as Aikens (1977: 212) pointed out, stylistically based analyses provide "the only real potential for defining sociocultural boundaries or interaction spheres, diffusion trends, and migrations," then stylistic analysis should be a primary tool for any broad-based reconstruction of Great Basin linguistic prehistory. The potential for use of stylistic information contained in projectile points to monitor inter-group and intra-group relations is addressed by Weissner (1983: 272).

In this paper I have argued for the occurrence of two periods of prehistoric occupational hiatus in the northwestern Great Basin. In nearby Surprise Valley, O'Connell (1975: 46) recognized the earlier hiatus be-

tween the so-named Menlo and Bare Creek phases. O'Connell suggested a Sahaptin linguistic affiliation for the Menlo phase because its earth lodges and Northern Side-notch points appear closely related to similar configurations in the Columbia Plateau. Beginning with the following Bare Creek phase, characterized by brush structures and Gatecliff Split-stem points, O'Connell saw an archaeological continuum leading to the Bidwell phase (Numic-speaking Surprise Valley Paiute) at the end of the cultural sequence. Nonetheless, O'Connell (1975) found the prospect of a Numic occupation spanning almost 6,000 years unsettling because it contradicted Lamb's (1958) model of a much more recent expansion of Numic speakers.

O'Connell's 6,000-year continuum may be more apparent than real. The problem is that the terminal Bidwell phase, which is not represented at any of the sites he excavated, may not exist. O'Connell believed that since the ethnographic Surprise Valley Paiute were real, they had to be represented by Desert series points elsewhere in the valley at localities yet to be discovered. In examining amateur artifact collections from Surprise Valley, this author has found very few Desert series points — suggesting, perhaps, that there was but limited prehistoric occupation of Surprise Valley by Numic speakers. In short, hydration data from the High Rock Country appear to show a mid-Mediterranean period of abandonment that was followed by an occupation by the presumably Numic-speaking manufacturers of Desert series points. It is suggested here that this period of abandonment also occurred in Surprise Valley, but that the valley was never again occupied until well into the historic era.

The problem may have been that Surprise Valley marked the unfriendly boundary between newly arrived Paiute in the High Rock Country to the east and Pit River peoples to the west. Elsewhere (Layton 1977b: 244,

1978: 248, 1981: 130) I have shown that emigrants following the Lassen-Applegate wagon road between A.D. 1847 and 1849 had numerous first-person interactions with Paiute throughout the High Rock Country, but practically none in Surprise Valley, which seems to have been largely unoccupied. The data source on 19th-Century Paiute occupation in Surprise Valley has traditionally been "Ethnography of the Surprise Valley Paiute" by Isabel Kelly (1932), but it is now recognized (Voegelin 1956: 4) that Kelly unknowingly described the lifeways of post-1860 emigrants into the valley from Oregon and not those of a native population. All evidence indicates that there were few Paiute in Surprise Valley until after the establishment of Fort Bidwell in the 1860s.

Who, then, expanded out of the central Great Basin to reoccupy Surprise Valley and the High Rock Country ca. 4000 B.C., following the retreat of Menlo phase peoples possessing a Plateau affinity? What was the ethnolinguistic affiliation of these new arrivals who were to begin an unbroken occupation of the region lasting throughout the duration of Gatecliff Split-stem, Elko Eared, and Rosegate series projectile points, until circa A.D. 1000? Given the current state of knowledge and low level of sophistication in linguistic archaeology, this author believes that at present such questions cannot be answered with any degree of credibility.

Recently, at Kramer Cave on Lake Winnemucca, Hattori (1982: 155) identified as Penutian a component, dated to 2200 B.C., rich in Gatecliff Split-stem points. This Penutian attribution was based primarily on the abundance of associated California trade goods. Although Hattori produced an excellent archaeological monograph, the bridging argument used to justify a Penutian linguistic assignment for this component suffers from a major methodological obstacle. With equal facility, occupants of the High Rock County

and Surprise Valley from roughly 4000 B.C. to A.D. 1000 can be variously labeled as Penutian, Hokan, or Uto-Aztecan speakers, but this is linguistic sleight of hand. At present there is neither a body of theory nor a methodology, other than the *direct historical approach*, that can allow one to make linguistic assignments to archaeological assemblages in a manner that can be replicated by independent researchers. Unfortunately, the *direct historical approach* demands an unbroken evidentiary chain leading from the ethnographic present into the archaeological past. Evidence for two breaks in the archaeological sequence of northwestern Nevada and northeastern California has been presented here. If, in fact, these breaks are real, bridging them linguistically should test our mettle.

In conclusion, most Great Basin archaeologists are fully aware of the "Danger Cave Syndrome," namely the pitfalls that accompany generalizations about a region based on materials recovered from a single site. Those concerns certainly apply to the arguments offered above. Thus, I hope that the present effort will inspire the framing of alternative hypotheses and a continuation of problem-oriented research in the northwestern Great Basin.

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As teacher, friend, and colleague, the late Martin A. Baumhoff was a major influence in the lives of two generations of Great Basin researchers. Speaking as one of his students, but expressing the feelings of all, we will miss his disciplined thought, his elegant and original assaults on messy problems, his spartan prose, and his genuine pleasure in a well-fought argument.

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