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Pueblo Settlement, Architecture, and Social Change in the Pueblo Revolt Era, A.D. 1680 to 1696

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In A.D. 1680, the Pueblo Indians of the American Southwest united in a revolt that drove Spanish colonists out of Pueblo lands for more than a decade. Dramatic changes in the architecture, spatial organization, and settlement patterns of Pueblo villages occurred during this era as Pueblo leaders sought to revive traditional beliefs and practices. Semiotic and space syntax analyses of 10 Pueblo Revolt-era (1680–1696) villages reveal evidence for an ideology of cultural revitalization, as well as changing patterns of leadership and social interaction. Villages built early in this period exhibit planned communal construction and evidence of strong centralized leadership that resulted in highly structured social interaction. In contrast, later villages are characterized by less centralized leadership and a dispersed layout that facilitated the informal interactions necessary for communal integration in a time of increased migration. The social changes reflected in and shaped by Revolt-era architecture were crucial in the formation of modern Pueblo culture, influencing village alliances and spatial organization down to the present day.

Introduction

After 140 years of Spanish exploration and colonization, the Pueblo Indians of the American Southwest united with Navajo and Apache allies in an armed revolt to drive the Spaniards from their lands (FIG. 1). In August of 1680, Pueblo warriors executed Franciscan priests and Hispanic settlers, burned missions and haciendas, and laid siege to the Spanish capital of Santa Fe. The European settlers who survived this onslaught fled to El Paso del Norte (present-day Ciudad Juarez, Mexico), where they temporarily reestablished their colony. The Pueblo Revolt of 1680 was thus the earliest and most successful native insurrection along the northern Spanish frontier, and for a period of 12 years the Pueblo Indians were free of colonial domination.

The Pueblo Revolt era of 1680–1696 witnessed dramatic changes in the architecture, spatial organization, and location of Puebloan settlements. Prior to the Revolt of 1680, Pueblo peoples were concentrated in mission villages and *visitas* (unstaffed mission facilities) as part of the Franciscan missionary program (Espinosa 1988). Most of these villages were founded before the arrival of the Spaniards, and were converted into missions through the establishment of churches (FIG. 2A). After the Revolt of 1680 there was significant population movement and relocation; some eastern Pueblo districts were entirely vacated with people taking refuge among the Hopi, Zuni, and Navajo. For example, Tiwa- and Tewa-speaking peoples left their Rio Grande homeland during this period and established the villages of Payupki and Tewa Village on the Hopi mesas (Brandt 1979: 345). More commonly, districts were reorganized and new villages were constructed in defensive locations, often on the tops of high mesas. At Hopi, villages at First and Second Mesa moved from
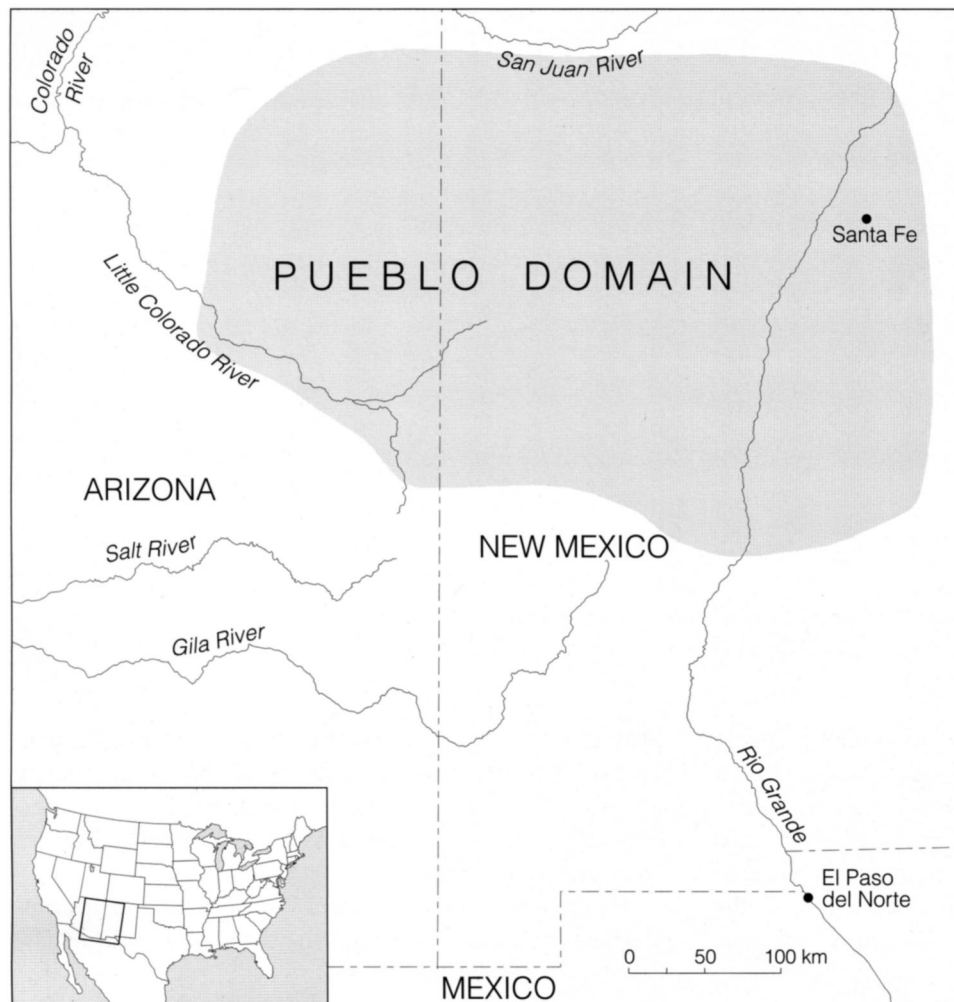
Figure 1. The Pueblo Southwest. Drawing by Ronald Stauber.

springs on or near the valley floor to mesa tops, where they remain today (Brew 1979: 522). Most of the new villages founded during this period were short-lived, however. With the completion of the Spanish reconquest in 1696, all of the pueblos situated on mesa tops (except Acoma and the Hopi villages) were vacated, and the Pueblo peoples moved back down to mission villages on the valley floors where they live today (FIG. 2B).

Our study employs semiotic and space syntax analyses to examine the architecture and settlement patterns of the Pueblo Revolt era in order to better understand the social changes that occurred during this period. We argue that these villages played a central role in the creation of Pueblo identities, as leaders used architecture and village locations to establish a revitalization movement. Near the end of the Revolt era, this revitalization ideology diminished as a concurrent increase in migration resulted in changes in the spatial organization of pueblo sites that facilitated the integra-

tion of new peoples into multi-ethnic communities. The events of this era also played a critical role in the formation of the modern Pueblo world, affecting village alliances, social organization, and community identities to the present day. An archaeological examination of this period links contemporary Pueblo culture with the past, providing a better understanding of the evolution of modern Pueblo cultures and society. Further, we believe that our study, which employs architectural analyses to investigate questions of ideology and social interaction, will be of interest to all archaeologists seeking to interpret changing patterns in the spatial organization of settlements.

Architecture, Social Identity, Social Interaction, and Ideology

Social identity, social interaction, and ideology are three aspects of the Pueblo Revolt era that can be studied using architecture. The history of the Revolt is often described in
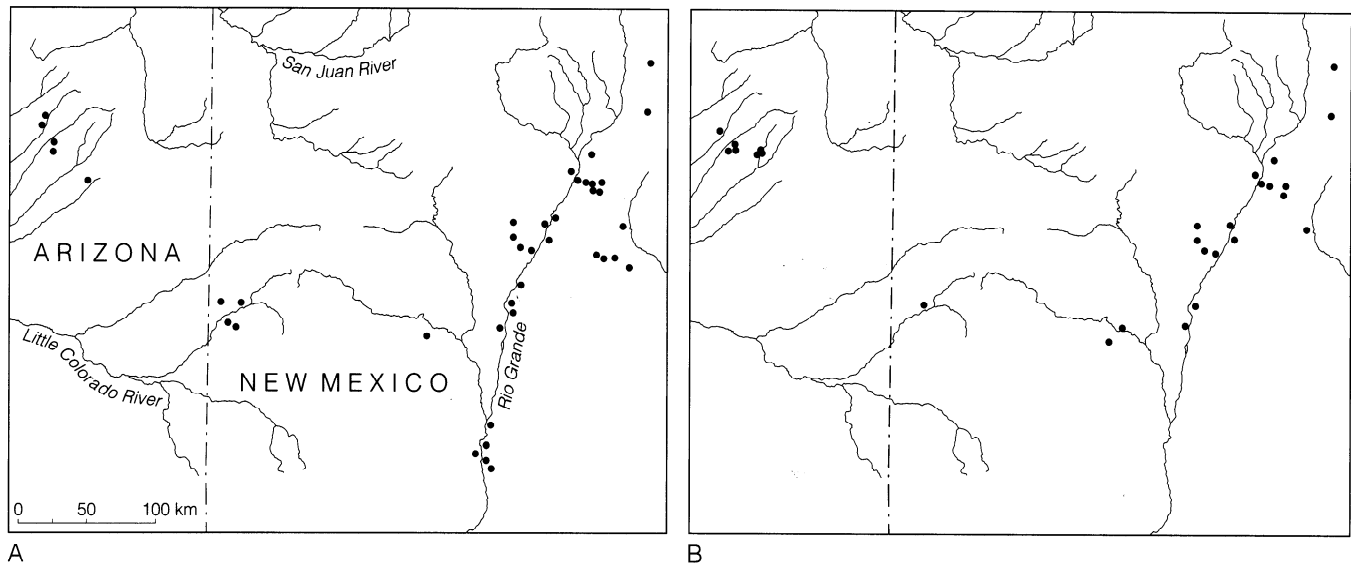
Figure 2. Locations of Pueblo villages. A) Pre-Revolt mission villages and visitas ca. 1680 (after Vetancurt 1971 [1697]); B) Post-Revolt pueblos ca. 1700. Drawing by Ronald Stauber.

terms of social groups, with discrete, identifiable Pueblo groups opposing Spanish settlers and missionaries (Knaut 1995; Weber 1999). Spanish chroniclers attributed specific actions to the members of specific Pueblos, and charted both the insurrection and eventual reconquest in terms of the political geography of these tribes (Hackett and Shelby 1942; Kessell and Hendricks 1992; Kessell, Hendricks, and Dodge 1995, 1998). Many processes of ethnogenesis are evident in the interactions that occurred between peoples of diverse linguistic and cultural backgrounds during this period, with new social identities constructed in the midst of migration, the founding of new settlements, and the adoption or revival of religious beliefs and cultural symbols (Moore 2001; Terrell 2001; Preucel, Traxler, and Wilcox 2002).

Today, individual members of Pueblo tribes have multiple identities based on biological ancestry, gender, household membership, kin and clan, association with ritual organizations, village residence, and shared languages, much as they did in the 17th century (Ferguson 2004). These characteristics provide a palette of identities that have been used to define and negotiate individual social identities through recursive patterns of social interaction. A person does not have a single social identity, but many identities that are expressed in various ways to achieve individual goals. In some contexts, Puebloans will identify themselves as members of a specific tribe. In other contexts they may accentuate membership in a clan that is found at other pueblos, facilitating migration and residence in another village. The ability of Pueblo peoples to utilize their multiple

identities was a crucial element in the formation of the pan-Pueblo alliance that made the Revolt of 1680 a success, and was a factor in the founding of more than 10 new pueblos between 1680 and 1694, a period of substantially increased Pueblo migration.

Much of the existing archaeological literature concerning identity focuses on a single dimension of social identification—ethnicity. Ethnic groups have been conceived as bounded social units formed in opposition to other groups, with each maintaining social, political, ideological, and geographical boundaries (Barth 1969; Stark 1998). As Lomawaima (2004) points out, however, integration, blending, and coordination of activities are as important as oppositional differentiation in creating and re-creating social identities. In contrast to the ethnic homogeneity of the pre-Revolt mission Pueblos, the villages established during the Revolt era were often multi-ethnic communities, and a range of social identities must have been drawn upon to foster the social integration and cooperation needed to sustain these new communities in a perilous time.

Our hypothesis is that social groups can be tracked using both overt ideological signs of ethnicity and less obvious material correlates of enculturation, the process by which the behavioral norms of a society are acquired by its members (Clark 2004). Domestic and village spatial organization can be viewed as the result of cultural processes entailed in the construction and use of houses. Village plans are analyzed here as a means to identify different paradigms of layout, e.g., plaza-oriented pueblos versus rancheria (dispersed) settlements. Village plans are subject-

ed to syntactical analysis to provide a quantitative measure of how their spatial organization either facilitates social interaction or makes it more difficult (Hillier and Hanson 1984; Hillier 1996; Hanson 1998). This systematic analysis of village plans is necessary for comparing the differing layouts of Pueblo Revolt villages.

To evaluate the ideological and social meanings of the architectural plans of these villages, we note that meaning is an ever-shifting relation among an object (which exists in the world), a sign (a thing that represents the object), and an interpretant (an idea produced in the mind by the sign). The production of meaning is thus intimately associated with human cognition. The study of the logic of signs to understand meaning was proposed by the philosopher Charles Sanders Peirce, a founder of modern semiotics (Peirce 1992, 1998). In Peirce's approach, symbolic meaning (largely arbitrary and agreed upon by convention) is one of three levels of semiotic meaning. Signs also transmit meaning via iconic or indexical properties (Peirce 1992: 143–144). Iconic signs bear a formal resemblance to their objects (maps, photographs, and anthropomorphic figurines all transmit meaning via their iconic properties), while indexical signs transmit meaning through the contiguity of sign and object, by "pointing to" certain relationships (a weathervane is the classic example).

It can be argued that material culture, including Pueblo architecture, carries much of its meaning through iconic and indexical properties. These levels of meaning are often less ambiguous than symbolic properties. Many signs are not arbitrary because their elements have definite relations to their referents. While it is true that the meanings of signs may change, the iconic and indexical components of signs are more fixed than symbolic meanings. We think that analyses of the iconic and indexical meanings and of the syntactical measures of architecture reveal important new information regarding changes in social identity, social interaction, and ideology during the Pueblo Revolt era.

The Pueblo Revolt

The Pueblo Revolt of 1680 was instigated by a coalition of ritual leaders, acting under the direction of Popé, a Tewa Indian from San Juan Pueblo (Knaut 1995: 167–180). In a meeting of religious leaders at the Tiwa-speaking village of Taos Pueblo, Popé espoused a message of cultural revitalization involving the renunciation of Spanish beliefs and customs, ritual purification, performance of traditional ceremonies, and an armed insurrection to destroy the Christian missions and retake Pueblo land from Spanish and Hispanic colonists. On August 10, 1680, Catholic priests were killed, churches destroyed, and haciendas raided. The colonists who survived the initial onslaught sought refuge

in the colonial capital, Santa Fe. By late August, the capital was under siege by 2500 Pueblo warriors. After Pueblo forces severed the water supply to Santa Fe, the Spaniards retreated southward to El Paso del Norte accompanied by Tiwa allies (Hackett and Shelby 1942).

Following the Revolt, Popé and other leaders continued to extol their message of cultural revitalization. They encouraged the Pueblo people to eliminate all Spanish influence from their lives and revive their traditional pre-Hispanic ceremonies and beliefs. It is reported that Popé told the Pueblo people to live "in accordance with the law of their ancestors," abandoning their mission villages and erecting traditional pueblos in the manner of their pre-Hispanic predecessors. If they did this, he promised "they would harvest a great deal of maize, many beans, a great abundance of cotton, calabashes, and very large watermelons and cantaloupes" (Hackett and Shelby 1942: 248). Many Pueblo communities complied, bringing about the extensive changes in Pueblo architecture and settlement patterns that are distinctive of the Revolt era.

Historians examining the Pueblo Revolt have based their studies on 17th-century Spanish military journals and court testimony, documents that are silent about many aspects of Pueblo life (Espinosa 1988; Knaut 1995; Weber 1999). Moreover, because Pueblo peoples did not record the events of this period in writing, studies have focused only on the beginning and end of the Pueblo Revolt era. As a result, these histories have been told from Spanish perspectives, concentrating on the causes of the Revolt and the battles that accompanied Diego de Vargas's reconquest (Weber 1999). Very little attention has been paid to the events that occurred during the period of Pueblo independence between 1680 and 1692.

Archaeology provides a valuable perspective for enriching our understanding of the events that transpired during the Pueblo Revolt era (Preucel 2002a). The archaeological record offers a view of history that is independent of Spanish chronicles, allowing a glimpse into the lives of the Pueblo peoples who lived during this turbulent period through the artifacts and architecture they created. This period produced an assemblage of material culture bridging the pre-Hispanic and modern Pueblo worlds (Preucel 2002b), including the architecture, spatial organization, and settlement patterns of Pueblo Revolt villages.

Puebloan Settlement Patterns in the 17th Century

Pre-Revolt Settlements

At the time the peoples who came to be known as "Puebloans" first encountered the Spaniards (A.D. 1540),
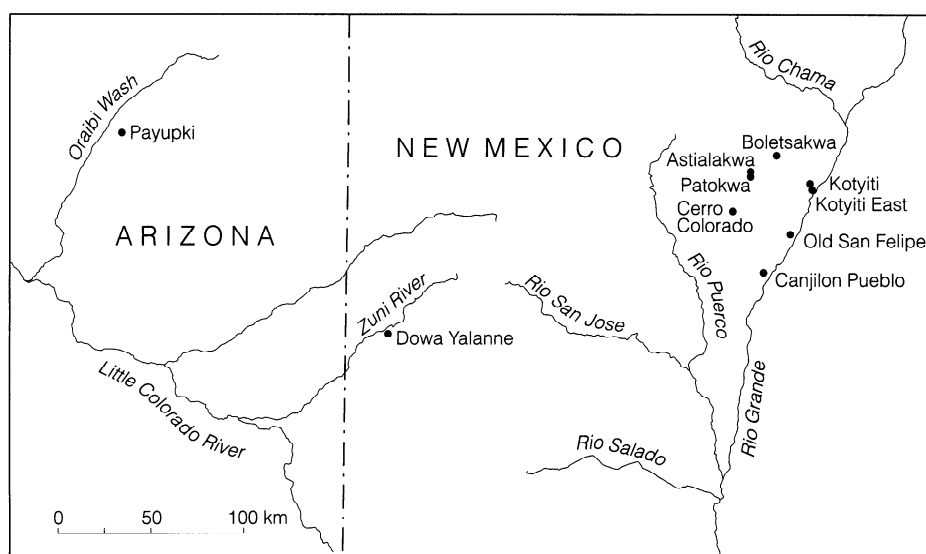
Figure 3. Pueblo Revolt mesa-top villages analyzed in this study. Drawing by Ronald Stauber.

they generally occupied densely packed clusters of large, plaza-oriented villages (Schroeder 1979). The pueblos in these clusters were often located on or near the valley bottoms in proximity to the best agricultural land. There is a significant amount of variation in the settlement plans within and among these pre-Hispanic village clusters, but virtually all of the pueblos were oriented around one or more plazas with kivas used in the performance of ceremonial activities. Although these peoples shared broad similarities in material culture, religious practices, and social organization, they also differed from each other in significant ways. They spoke seven different languages, some of which had several dialects. The languages spoken in different settlement clusters formed a key basis for political and social alliances among otherwise autonomous villages.

Between 1540 and 1680, there was a substantial decline in population and concomitant reduction in the size and total number of Pueblo villages (Reff 1991; Levine and LeBauve 1997). These demographic changes were caused by the introduction of new diseases in the Southwest, the implementation of Spanish colonial policies, and the appropriation of land and resources by the Spaniards. After 1609, when the Spanish government committed to supporting New Mexico as a mission field, mission churches and visitas were established at the major Pueblo villages and administered by Franciscan priests. The Spanish policies of *congregacion* and *reduccion*—moving native populations living in dispersed communities into fewer settlements to facilitate proselytization and instruction in European methods of farming and herding—further aided in the attrition of pueblos (Schroeder 1979; Rothschild

2003: 96–119). Immediately preceding the Pueblo Revolt of 1680 there were 47 recorded mission pueblos (Vetancurt 1971 [1697]), a significant reduction from the 75–80 large pueblos that are estimated to have existed prior to Spanish colonization.

Revolt-Era Settlements

During the Revolt of 1680, many Pueblo communities destroyed churches and left their mission villages to construct new pueblos (Hackett and Shelby 1942). A number of Pueblo communities established mesa-top villages at least partially in anticipation of Spanish attempts at reconquest (FIG. 3). Spanish forces made several abortive attempts to retake the region in the 1680s, and although they were unable to regain complete control until 1696, these early attempts sometimes inflicted significant casualties at southern Pueblo villages. In 1689, for example, Domingo Jironza Petris de Cruzate attacked Zia Pueblo, killing more than 600 inhabitants (Kessell and Hendricks 1992: 25–26). These brutal attacks left no doubt among the Pueblo peoples that the Spaniards would wage a bitter military struggle to regain their colony. Following Jironza's attack, the Zia constructed a new mesa-top village (Cerro Colorado) for their protection, as did many other Puebloans throughout the Revolt era.

These post-Revolt villages were constructed in classically defensive positions on the tops of high, steep-sided mesas, often fortified with walls and bulwarks at the mesa edges where Pueblo warriors could resist attacks. The construction of pueblos in defensible positions created formidable strongholds against the reconquest campaigns of the

Spaniards, and provided protection from the increasingly frequent raids of the Apache, Navaho, and Ute. The mesas chosen for these refuges range in elevation above the valley floors from 67 m (at Patokwa) to 317 m (at Astialakwa). The long, narrow, peninsular shape of these landforms, combined with steep sides and sheer cliffs, provided limited access to the mesa-top villages. In some cases only one or two narrow trails permitted access, enabling the defense of the villages by only a few people. At Astialakwa, for example, the top of the main trail passes through a meter-wide gap between two boulders, allowing a single person to defend against multiple attackers. At the tops of trails accessing Dowa Yalanne, Kotyiti, and Astialakwa today there are piles of fist-sized cobbles—the remains of ammunition used in Pueblo slings, providing evidence of the active defense of these locations. At other Revolt-era sites additional features of the natural landscape were utilized for defense. The Jemez refuge of Patokwa was constructed on a raised peninsula between the confluence of two rivers, for example. These rivers present a natural obstacle to anyone approaching the site, providing a further line of defense against attack.

Although defensibility played a major role in the move to mesa-top sites, it was not the only factor influencing settlement patterns at this time; the ideology of cultural revitalization played a significant role in the location and construction of these villages as well. One of the ways in which Pueblo peoples revived pre-Hispanic lifeways was by returning to inhabit the same locations where their ancestors had lived before Europeans invaded and contaminated the Pueblo world (Suina 2002). Six of the ten Revolt-era mesa-top villages analyzed for this study were constructed on or adjacent to earlier pueblos. This association of new and old pueblos enhanced the meaning of these places for the inhabitants, reinforcing the revitalization ideology of a return to traditional Pueblo ways of life. In semiotic terms, the locations of these Revolt-era villages are indices of the perceived relationship between the 17th-century Puebloans and their pre-Hispanic ancestors—that is, the location of these sites in the cultural landscape "points to" their special meaning through a spatial association with ancestral sites.

At some Revolt-period sites the architectural remains of earlier Pueblo settlements are conspicuous on the surface, and would have served as daily reminders of their ancestors' presence. At the Zuni refuge of Dowa Yalanne there are earlier components dating to the 12th or 13th, and the 16th centuries underlying and adjacent to the Pueblo Revolt settlement (Hodge 1937: 38–40; Ferguson 1992: 87, 1996: 47–55). Similarly, at Patokwa and Boletsakwa the architectural remains of villages dating to A.D. 1250–1400
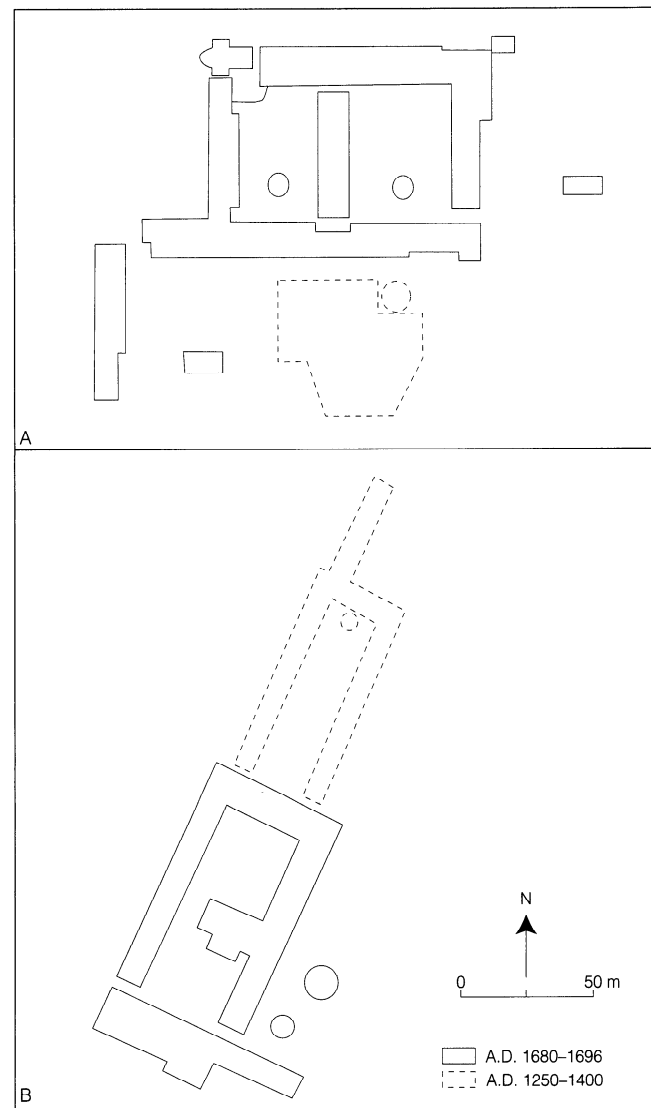

Figure 4. Revolt-era villages constructed adjacent to earlier pueblos. A) Patokwa; B) Boletsakwa.

are still visible (FIG. 4). Analysis of surface ceramics at the Cochiti refuge of Kotyiti has revealed a 12th and 13th-century use of the mesa in addition to the 17th-century component. Though the architecture of the earlier occupation at Kotyiti is no longer visible, earlier ceramics were mixed in with the mortar used in the construction of this new village.

In other cases, small groups of Puebloans reoccupied ancestral sites by moving directly into older architectural units or by constructing new dwellings on top of larger ancestral sites. Ceramic and architectural evidence suggests small late 17th-century reoccupations of many ancestral Jemez sites (Elliott 1986). Similarly, a small group of remote

and largely inaccessible sites in Frijoles Canyon was likely reoccupied during this period (Liebmann 2002). The hidden and protected nature of these sites made this area an ideal refuge. Oral histories from San Ildefonso Pueblo also tell of the reoccupation of the mesa-top village of Nake'-muu by women and children during the Spanish Reconquest (Vierra, Nordby, and Martinez 2003). As was the case with the newly-constructed Revolt-era villages, Pueblo people seem to have chosen sites for reoccupation both because of their defensible locations and because of the ideological importance of living in the places their ancestors had lived.

At the same time these older sites were reoccupied and new mesa-top villages were established, some pueblos in the valley bottoms continued to be inhabited. A complex ebb and flow of people into and out of valley-bottom and mesa-top pueblos occurred in response to changing political and military circumstances. Spanish chronicles indicate that the valley pueblos were periodically vacated when threatened. For instance, allies of the Spaniards at the Keresan village of San Felipe moved to the village of Old San Felipe, located on the mesa overlooking their home pueblo on the banks of the Rio Grande, presumably because they were threatened by the people of Kotyiti (Kessell, Hendricks, and Dodge 1998).

Spatial Organization of Mesa Villages

Formal Attributes

Data available in publications and the Archaeological Records Management System of the Museum of New Mexico, supplemented with fieldwork at several sites to verify site plans, were used to compile information about the spatial organization of 10 Pueblo Revolt-era mesa-top villages (FIG. 5): Kotyiti (LA 295), Kotyiti East (LA 84), Old San Felipe (LA 2047), and Canjilon Pueblo/Old Santa Ana (LA 2049) located on mesas overlooking the Rio Grande Valley (Bandelier 1892; Logsdon 1993: 133–134; Preucel 2000a); Boletsakwa (LA 136), Astialakwa (LA 1825), Patokwa (LA 96), and Cerro Colorado (LA 2048) in the Jemez mountains (Dougherty 1980; Elliott 1986; Holmes 1905); Dowa Yalanne, near Zuni Pueblo (Mindeleff 1891: 89; Ferguson 1996: 47–55); and Payupki (NA 1040), a village on the Hopi Mesas occupied by Tiwa immigrants from the Rio Grande toward the end of the Revolt era (Mindeleff 1891: 59–60). All of these mesa-top villages were constructed and occupied for relatively short periods of time (usually less than 14 years). Their architectural plans are generally not obscured by earlier or later occupations, as are Acoma, the Hopi village of Walpi, Nake'-muu, and other sites with Revolt-era components. The

generally good preservation of these mesa-top pueblos and the absence of subsequent settlement make it possible to investigate the architecture for evidence of Puebloan responses to political and cultural stress during this period.

The site plans of these 10 mesa-top villages reveal a number of interesting formal attributes. There is substantial variation in layout and size. Seven of the villages include formal plazas, which are defined as open areas delineated by architectural units on four sides. Three of these sites—Kotyiti, Patokwa, and Boletsakwa—share distinctive double plaza plans. Other sites have curvilinear, L-shaped, or parallel architectural units. Several sites, including Astialakwa, Dowa Yalanne, and Kotyiti East, have a large number of buildings dispersed in space and a less formal layout than the plaza-oriented villages. Two communities—Dowa Yalanne and Kotyiti/Kotyiti East—have both large formal pueblos and dispersed buildings. Boletsakwa, Kotyiti, Patokwa, and Payupki have identifiable ceremonial architecture (one or more kivas, either within plazas or outside the pueblo) while other sites lack these ritual features, suggesting a shorter period of anticipated occupation.

Structural Analysis

In order to investigate structural differences in the utilization of open architectural space, the method of "space syntax" was used. This method was developed to quantify the spatial relationships formed by architecture and interpret how these relationships structure and control the movement of people, and hence social interaction, within buildings and settlements (Hillier and Hanson 1984; Hillier 1996; Hanson 1998).

The method requires that the open area within a settlement be divided into the fewest possible convex spaces, i.e., areas in which no tangent drawn on the perimeter passes through the space (FIG. 6). A person standing in a convex space has a clear and unobstructed view of the entire area. The next step requires that a series of axial lines be drawn through convex spaces by inscribing the longest straight line through the open space, and continuing until all convex spaces have been crossed. In an axial space, a person is able to see, move along, and interact with other people through the entire route of the line. These techniques produce axial graphs whose spatial properties can be quantified.

We concentrated on "integration," the syntactical measure that quantifies the "depth" each axial space is from every other space in a site plan (Hillier and Hanson 1984: 108). Integration measures how many "steps" or spaces one has to pass through in order to move among different places in a settlement, and then compares the value of each
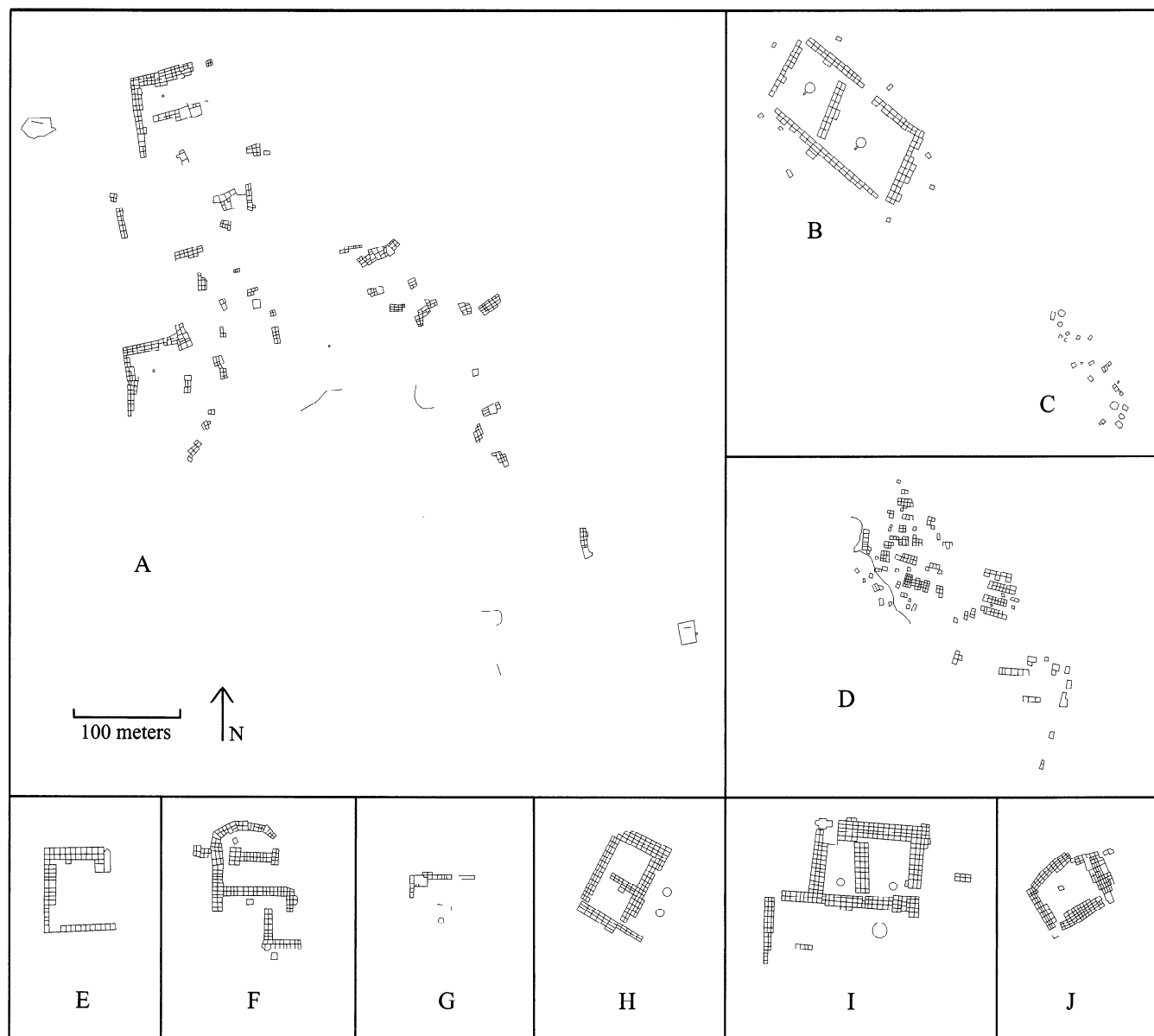
Figure 5. Plan views of Pueblo Revolt mesa-top villages analyzed in this study. A) Dowa Yalanne; B)
Kotyiti; C) Kotyiti East; D) Astialakwa; E) Old San Felipe; F) Cerro Colorado; G) Canjilon Pueblo; H)
Boletsakwa; I) Patokwa; J) Payupki.

space to every other space in a settlement. This measure is standardized to enable the comparison of axial systems of different sizes. High values of integration indicate an axial space is well connected to other spaces in a settlement, making movement among them relatively easy. Low values indicate spatial segregation, where relatively isolated axial spaces constrict movement.

The distributions of integration values for the 10 villages analyzed here are depicted as notched box plots (FIG. 7). An analysis of these values indicates that there are statistically significant differences in the spatial structures of

many of the Revolt-era mesa-top villages. Our analysis shows that the three sites with dispersed plans—Kotyiti East, Astialakwa, and Dowa Yalanne—have higher mean integration values than those of the other villages. The well-integrated spatial structure of these sites suggests that their defensibility came from their location on top of high, steep-sided mesas rather than from any fortress-like configuration of their architecture. After one gained access to the mesa tops, it was easy to enter and move around within the villages.

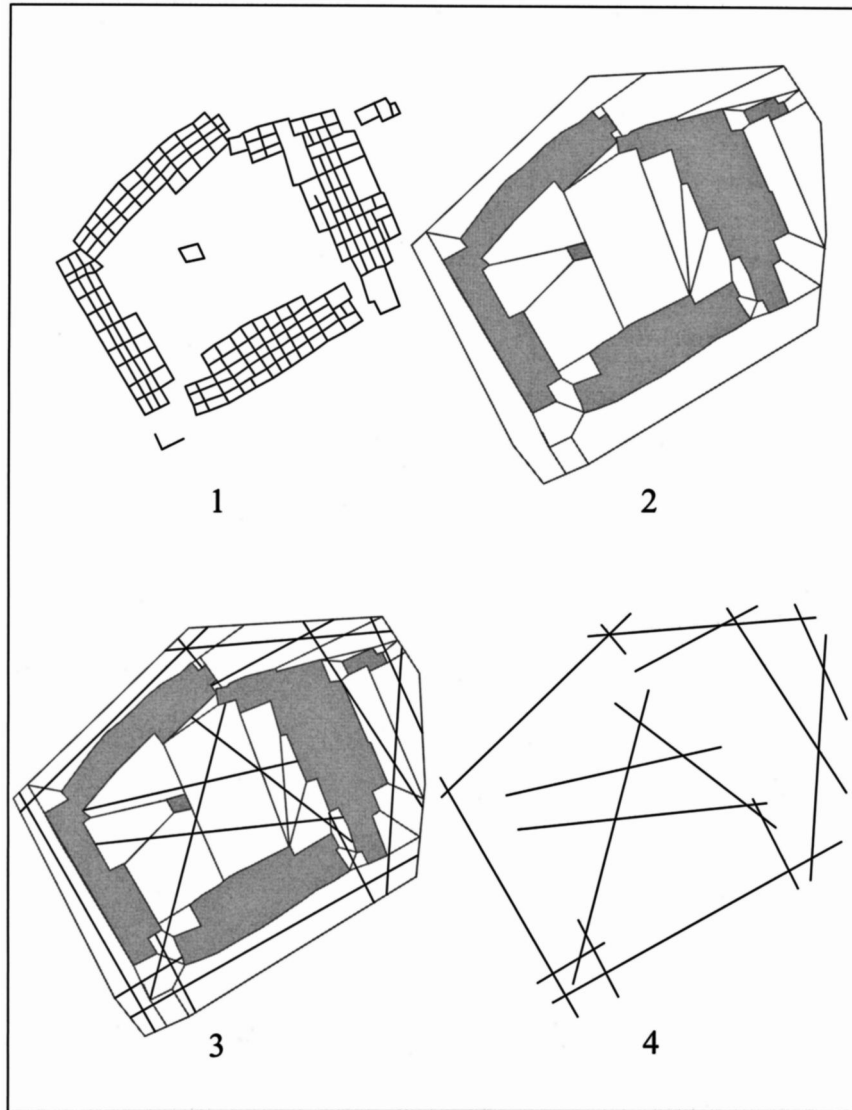Dowa Yalanne presents an interesting case because its

Figure 6. Method of space syntax applied to the site of Payupki in the Hopi district. Step 1) Site plan; Step 2) Convex space map; Step 3) Axial space map; Step 4) Axial space graph.

spatial integration is similar to both the dispersed plan of Astialakwa and the plaza-oriented plan of Kotyiti. Kotyiti, in turn, has a structural similarity to the other plaza-oriented pueblos of Boletsakwa, Patokwa, and Payupki that are significantly less integrated than Dowa Yalanne. To determine whether the similarity between Dowa Yalanne and Kotyiti was due to the nine isolated rooms that surround the dual-plaza pueblo, the main room blocks at Kotyiti were analyzed with and without these outliers, revealing that the two configurations of Kotyiti are statistically similar to each other and to Dowa Yalanne. Although their plans appear very different, Dowa Yalanne and Kotyiti exhibit similarities in the integration of their spatial structures. This similarity is likely due to the presence of the two

large L-shaped residential units at Dowa Yalanne, and the influence these have on the overall spatial structure of the site.

In the villages with low integration values (Kotyiti, Canjilon, Boletsakwa, Patokwa, Old San Felipe, Payupki, and Cerro Colorado), movement within the pueblos would have been somewhat restricted, and many public activities would have been carried out in the plazas in view of the other inhabitants. The spatial organization of these villages suggests a greater degree of social control exercised by a central decision-making authority, either a *cacique* (traditional Pueblo village leader) or a council of religious leaders. The segregation of space in the plaza-oriented pueblos meant that access within the settlements was restricted to
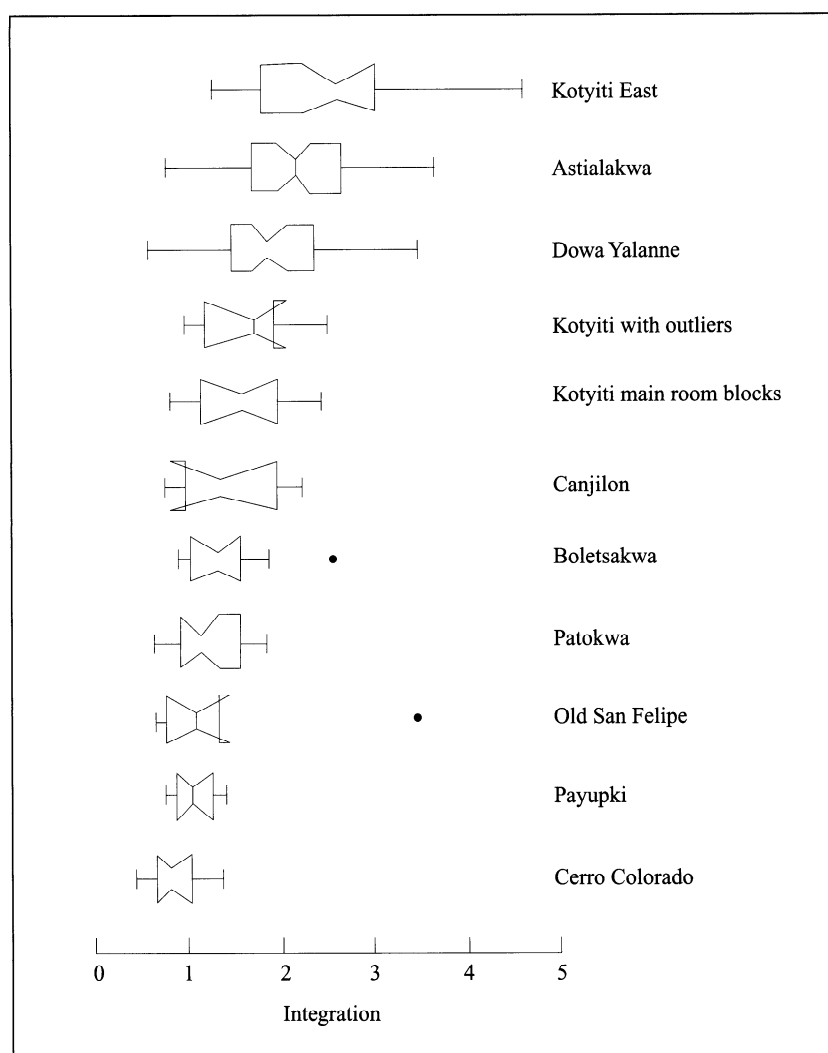
Figure 7. Notched box plots of integration values for Pueblo Revolt mesa-top villages. These box plots illustrate the range of integration values for each site, along with the median value (at the center of the notch), and the confidence intervals of the distribution (defined by the edges of the notch). Where the notches of box plots overlap, the distributions are statistically similar; where notches do not overlap, the distributions are statistically different. (Kruskal-Wallis One Way Analysis of Variance statistic = 111.117, probability = 0.000.) Bullets represent statistical outliers. Sites are arranged on the vertical axis according to their integration values. The plan of Patokwa was analyzed to incorporate four open corner gates, as described by Vargas in 1694 (Kessell, Hendricks, and Dodge 1998: 335). Three of these were filled in after the Spanish reconquest with the construction of additional rooms.

movement along pathways governed by gateways. The architecture physically channeled social interaction and segregated specific areas of the pueblo associated with particular social groups. This may be related to the fact that some religious and political activities were carried on in secret, as they had been in the home villages occupied before the Revolt. Payupki, the settlement constructed by Tiwa immigrants to the Hopi Mesas, exemplifies the highly segregat-

ed spatial structure that stands in marked contrast to the integration of the dispersed settlements. The architectural plan of Payupki has a clear internal focus that physically separated its residents from their hosts at the neighboring Hopi villages. Payupki was an ethnic enclave at Hopi, and its residents used the architecture of their village to set themselves apart and maintain their distinct social identity.

Additionally, bonding and abutment patterns show that

the plaza-oriented villages exhibiting low integration values are made of long, linear room blocks resulting from "ladder-type" construction. This architectural form occurs when multiple rooms are constructed simultaneously by first building two long parallel walls, then subdividing the space between them to create individual rooms (Cameron 1999: 207). Ladder-type construction results from a group effort, indicating organization of labor above the household level (Cordell 1998: 27; Cameron 1999: 208). The construction of these plaza-oriented sites was the result of a coordinated effort resulting from a higher degree of planning, communal organization, and centralized leadership than that exhibited at the dispersed sites.

In the dispersed settlements with higher integration values (Kotyiti East, Astialakwa, and Dowa Yalanne), movement was comparatively unrestricted. We associate the relatively open settlement plans of these villages with a lesser degree of social control by a central authority or well-established traditional theocracy. The spatial orientation of dispersed settlements was directed toward the community as a whole. This contrasts with the more highly segregated spaces associated with religious activities of ritual groups in the plaza-oriented pueblos. Astialakwa and Kotyiti East lack any archaeological indication of formal kivas or subterranean features in marked distinction with many of the plaza-oriented pueblos. The absence of ceremonial kiva architecture at these dispersed villages could indicate that the people who resided at these sites had modified their traditional religious practices. Because there is a close connection between ritual and power in Pueblo society, the lack of religious architecture at the dispersed villages in the Rio Grande area implies a political or social relationship with the nearby pueblos. Kotyiti East is near Kotyiti, and it is possible that residents of this dispersed site participated in religious activities at the nearby plaza pueblo.

The situation at Dowa Yalanne is less clear because of the isolated location of the village and the presence of several shrines and unroofed structures that may also be ritual features (Ferguson 1996: 52–53). In addition, Vargas (1914: 304–305) described three kivas in the plaza of the pueblo he visited on Dowa Yalanne in 1692. Although there are no unambiguous archaeological traces of kivas on Dowa Yalanne, the site has not been excavated and these features may in fact be present but not visible.

At the dispersed settlements, there was a shift in the organization of labor during construction away from communal work groups to construction organized on the household level. Recent investigations of bonding and abutment patterns in the room blocks of Astialakwa and Dowa Yalanne reveal that the architecture was not the result of ladder construction; room blocks were built as one

to four-room suites. Even among the long, multi-roomed buildings at Dowa Yalanne and Astialakwa that appear at first glance to represent classic examples of ladder construction, patterns of abutment demonstrate that construction took place on a room-by-room—and probably household-by-household—basis. This shift in the social organization of labor from communal work groups to household-level construction was a significant factor affecting the spatial organization and integration values of the more dispersed sites.

Temporal Variation among Revolt-Era Pueblos

Many of the sites with low integration values display the classic characteristics of defensive pueblos defined by LeBlanc (1999: 57–58): they are newly-founded villages constructed in defensible locations with central plazas surrounded by inwardly-facing room blocks. It is curious then that sites such as Astialakwa, known to have been built in preparation for the impending Spanish attacks, display a dispersed spatial organization. Spanish military journals indicate that the Jemez vacated Patokwa and constructed Astialakwa between November 1693 and July 1694 on the precipitous mesa top above it (Kessell, Hendricks, and Dodge 1998). While this location was chosen for defensive purposes, the dispersed arrangement is not the expected layout of a rapidly constructed defensive pueblo: there are no aggregated, ladder-constructed, multi-storied room blocks facing central plazas. Ladder-type construction by community workgroups would have facilitated the need to build quickly, yet rooms were built separately by individual households. Dowa Yalanne exhibits a similar dispersed spatial organization, relying primarily on the natural landscape of the mesa for defense. Thus defensive considerations alone cannot account for the variation in spatial organization among Revolt-period pueblos.

Villages built earlier in the Revolt era display plaza-oriented patterns and low integration values, while sites constructed toward the end of the period exhibit dispersed layouts and high integration values. This pattern is most clearly evidenced at the Jemez refuge of Guadalupe Mesa, where two villages, Patokwa (constructed sometime after 1680) and Astialakwa (built in 1693–1694), were constructed and occupied sequentially within a 14-year period. The construction sequence of the 48 buildings on Dowa Yalanne has not been established, but it may be that the two large L-shaped pueblos were built first, and that the smaller room blocks were added at a later date.

Early Revolt-Period Sites: Dual-Plaza Pueblos

Patokwa shares a similar spatial arrangement with the pueblos of Kotyiti and Boletsakwa: dual-plaza construction
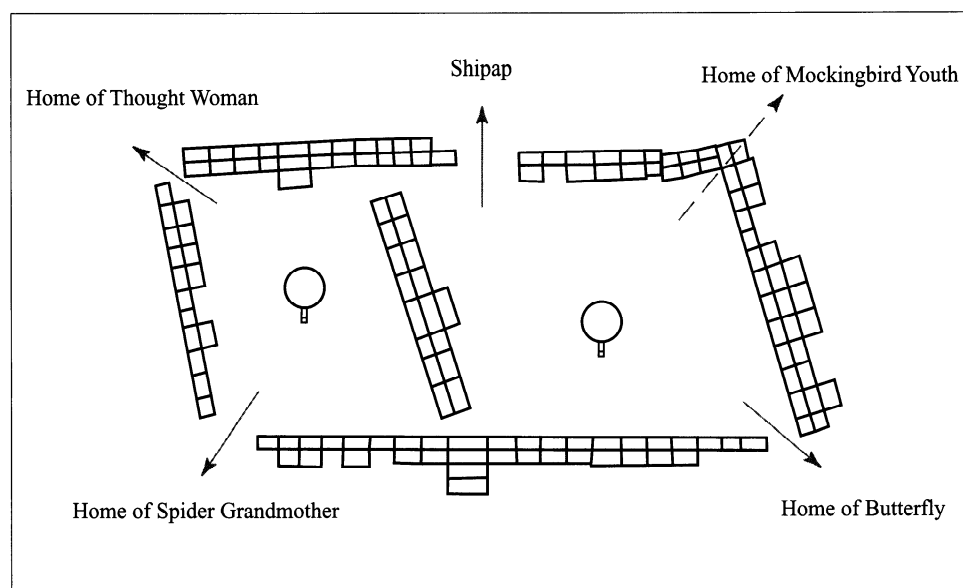
Figure 8. Schematic plan of Kotyiti showing the convergence of architecture and Keresan cosmology. Supernatural beings inhabit the places at the edge of the world; the gateways point to these areas and establish relations with the powers believed to dwell there. The northeast gateway, present when Vargas visited the site in 1692, was filled in with residential rooms late in the site's occupation. The center gateway likely gave access to Shipap, the place of emergence from the underworld.

with central room blocks and multiple open "gateway" corners. Tree-ring data and documentary evidence suggest that these pueblos were constructed early in the Revolt era (Robinson, Hannah, and Harrill 1972; Elliott 1986). Dendrochronological dates at Boletsakwa and Kotyiti cluster around 1683. All three are located within a days' walk of each other, and we think the similarity in spatial organization among these pueblos is not a coincidence but the result of the calls for revitalization of Pueblo culture that fueled the Revolt. The plans of these villages are of special interest because they embody elaborately coded architectural designs. This dual-plaza plan may be an idealized form of a "traditional" pueblo, representing the perceived layout of an archetypal Pueblo village. Preucel (Snead and Preucel 1999) has argued that Kotyiti functioned as an indexical icon of Keresan cosmology (FIG. 8). Some of the formal, plaza-oriented attributes of the dual-plaza pueblos appear to iconically represent important aspects of the Pueblo universe as recorded ethnographically (Ortiz 1969: 13–28). The open gateways at Patokwa, Boletsakwa, and Kotyiti point to the corners of the world and establish relations with the supernatural powers believed to dwell there. The double-plaza plan of these pueblos attests to the renewed importance of the traditional moietal social organization in establishing social and political balance. As icons, the architecture of Kotyiti, Boletsakwa, and Patokwa legitimized the political agenda favored by some of the leaders of the

Pueblo Revolt, reinforcing a perceived connection with pre-Hispanic Pueblo culture.

In addition to being iconic, the plans of these dual-plaza pueblos are indexical because the gateways and openings channeled the movement of people through these villages in ways that would remind them of the differences between this new village and the street-oriented layouts of their recently-vacated mission pueblos. This semiotic interpretation is consistent with the results of our space syntax analysis, which indicates a high degree of spatial segregation and relatively isolated axial spaces in the plaza-oriented pueblos.

Late Revolt-Period Sites: Dispersed Rancherías

The fact that Patokwa, Boletsakwa, and Kotyiti were constructed early in the Revolt era while Astialakwa and Kotyiti East were constructed at the end of the period accounts for the differences in village plans. The revitalization element of the Revolt era was strongest in the years immediately following 1680, and as time passed the movement lost momentum as many of the leaders who championed revivalism early on (including Popé) either died or lost their influence. Revitalization may have no longer been a central tenet when Astialakwa and Kotyiti East were constructed in 1694, because no effort was made to build the new village in the style of the pre-Hispanic pueblos.

One of the most important factors contributing to the

spatial organization of Astialakwa and other dispersed rancheria-style pueblos of this period was the increased migration of eastern Pueblo peoples at the close of the Revolt period. During the Spanish reconquest many Puebloans chose to leave their home villages and move from one refuge to another in an attempt to avoid the retaliation of the Spanish army. At the same time, many Pueblo warriors joined new communities to fight the Spaniards. Spanish accounts of the battle at Astialakwa state that the site was occupied primarily by the Jemez people, but that Santo Domingo, Acoma, Zuni, Hopi, and Apache warriors were living with them (Kessell, Hendricks, and Dodge 1998). The dispersed plan of this pueblo may reflect the need to incorporate both Jemez and non-Jemez people into a single multi-ethnic community. The room blocks at Astialakwa form three main clusters—a west group, an east group, and a south group. This arrangement reflects the fact that the Jemez people were probably maintaining subtle boundaries between groups through architecture and spatial organization. At Dowa Yalanne, the diversity in the number and size of the buildings, as well as the open structure, represents social experimentation in this period, as multiple villages coalesced into a single settlement (Ferguson 1996: 145). Families, clans, and villages were realigned, forming new social units. A similar plan seems to have been used at the Cochiti refuge of Horn Mesa, where diverse architectural styles exhibited at Kotyiti and Kotyiti East were utilized to maintain boundaries between different ethnic groups (Preucel 2000b). At the later dispersed sites, an increase in the mobility of Pueblo peoples and the need to incorporate multiple groups into these communities accounts for the shift from ladder-type construction to construction on the household level. Classic studies of segmentary societies have demonstrated that the most cohesive parts of these societies are households, the basal units of the social group (Chang 1958). When smaller migratory groups enter larger, pre-existing communities, new integrative mechanisms are developed to unite the various segments (Sahlins 1968; Smith 1974). Thus at the plaza-oriented pueblos, which were constructed early in the Revolt period by individual ethnic groups, integrative mechanisms such as communal labor groups resulted in ladder-type construction. At the late Revolt-period sites, however, the incorporation of multiple new immigrant groups into existing communities likely disrupted the integrative mechanisms in these communities, necessitating reorganization. When construction by household groups supplanted larger communal work groups, the result was a more dispersed site plan. As groups moved into dispersed villages, new houses could be added by appending rooms to existing room blocks or by constructing freestanding

buildings. It would have been easier for immigrant groups to construct architectural units in dispersed settlements than in plaza pueblos. Furthermore, the dispersed layout of the villages constructed late in the Revolt period may have helped to facilitate the integration of these outsiders into the newly founded villages by increasing informal interactions among inhabitants.

The transformation from aggregated to dispersed settlement layouts reflects the changing social milieu of this period, a time of increased migration and bloody warfare. Puebloans had to adapt to the mobile strategies employed by many groups. As a result, the spatial organization of their villages changed, reflecting revitalization and revivalism early in the period, and the increased mobility of Pueblo peoples during the Spanish reconquest.

Conclusions

Our analysis reveals patterned variability in architecture, settlement, and spatial organization in the wake of the Pueblo Revolt. For most Pueblo groups the move to mesa-top refuges in the late 17th century was the penultimate stage in a long history of migration and consolidation, culminating with the settlement of the villages currently inhabited by the modern Puebloans. The cycle is illustrated by the history of the Zuni region, where prior to 1680 there were six discrete villages. During the Pueblo Revolt, the people of these villages moved to Dowa Yalanne where they constructed a single new settlement. Following the reconquest, the Zuni people vacated their mesa-top village and moved to the village of Halona:wa, which is today known as Zuni Pueblo and is the primary residence of the tribe.

Other changes in spatial organization that occurred during the Revolt era have affected the layout and form of modern Pueblo villages. In the Jemez region, where there is a history of aggregated plaza-oriented pueblos dating to at least A.D. 1300, Astialakwa represents the first known shift to dispersed spatial organization. This form is utilized today at the modern Pueblo of Walatowa, where the Jemez people settled after the Revolt era. At the conclusion of the Revolt period, no group came down off the mesa to construct an aggregated, dual-plaza pueblo at its modern location. The majority of Pueblo villages today display some variation of a dispersed site layout (Stubbs 1950; Zubrow 1974).

The locations and layouts of the Pueblo Revolt villages, including both highly segregated plaza-oriented pueblos and highly integrated dispersed plans, as well as mesa-top and valley-bottom pueblos, are related to the ways that architecture was used to mediate shifting community and social identities. The architecture of these villages does not

merely passively reflect the changes in Pueblo culture that occurred following the Revolt of 1680—it also played an active role, serving to integrate different ethnic and social groups. Whether by reinforcing the ideology of revitalization or serving to integrate migrating groups into a new social order, the transformations in Pueblo settlement patterns and spatial organization forged in the Pueblo Revolt era were vital factors in the persistence of Pueblo culture from the 17th century to the present day.

Acknowledgments

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