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The Chaco Connection: Evaluating Bonito-Style Architecture in Outlier Communities

Ruth M. Van Dyke

Department of Anthropology, California State University, Fullerton, Fullerton, California 92834-6846

E-mail: rvandyke@fullerton.edu

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Because architecture shapes and is shaped by human actions and perceptions, architectural variability has the potential to provide information about relationships among prehistoric social groups. This study examines communicative and enculturative information contained in Bonito-style architecture constructed in Chaco Canyon and outlying communities during the late eleventh century A.D. Does the appearance of Bonito-style architecture at outliers constitute direct involvement on the part of a centralized, Chacoan entity or could local people have been emulating Bonito-style architecture they saw at Chaco or in neighboring communities? These questions have implications for existing models of Chacoan social organization. To investigate, a comparative architectural analysis uses data from 61 great houses in 55 outlier communities. Analysis is based on the premise that outlier similarity should reflect a unified, direct Chacoan source for Bonito-style architecture, and diversity should reflect the converse. Because highly visible, external architectural characteristics can be emulated, five internal, low-visibility great-house architectural attributes were selected for comparison. Results indicate substantial diversity is contained within the Chacoan world. A variety of relationships probably existed between outlier communities and Chaco Canyon, and a range of explanatory models is necessary. Bonito-style architecture is more likely to be associated with a struggle to legitimate social power than with spontaneous, cooperative communal activity. Competitive emulation may account for the appearance of Bonito-style architecture in outlier communities toward the local end of the outlier spectrum.

Architecture is an excellent source of information about past societies. Architecture shapes and is shaped by human activities and perceptions (Bourdieu 1971; Giddens 1984:143-158). Not only are architectural remains perhaps the most durable and the most visible aspect of material culture subject to the archaeologist's gaze, but buildings provide a direct means for reconstruction of the interactive, recursive relationship between lived experience and the built environment. Prehistoric structures have been employed by archaeologists in the American Southwest in the construction of temporal, social, functional, and demographic knowledge (Adams 1983, 1991; Cameron 1998, 1999; Ferguson 1996; Hunter-Anderson 1977; Kent 1990; Kintigh 1994; Lipe and Hegmon 1989; McGuire and Schiffer 1983; Schlanger 1986). Architectural variability has the potential to provide information about relationships among social groups. Prehistoric builders made choices about materials, techniques, and structural configurations that cannot be reduced to functional concerns. Low-visibility or internal architectural attributes lack overt communicative potential and thus reflect the learning frameworks of the builders; patterning among internal architectural characteristics can be used to distinguish

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groups with shared enculturative backgrounds (Carr 1995b). This study uses low-visibility architectural attributes in an attempt to disentangle the social relationships among the Chaco Anasazi of northwestern New Mexico in the late eleventh century A.D.

Chaco Canyon is found at the heart of the San Juan Basin, a topographic depression in northwest New Mexico characterized by gray-green plateaus broken by canyons, mesas, and scarps. Chaco is an ideal place to focus an architectural investigation, as the imposing ruins clustered at the heart of this desolate region of stark contrasts have drawn archaeologists' attention for over a century. Canyon great houses such as Pueblo Bonito and Chetro Ketl are among the best preserved prehistoric pueblo ruins in the Southwest, with standing walls in excess of 8 m in height. These planned, massive structures represent a substantial investment of labor and design. Great house construction was initiated in Chaco Canyon during the late ninth century and escalated through the early twelfth century A.D. During the same period, great houses and associated features appeared across the greater San Juan Basin, often in the midst of communities of small, domestic sites. Great houses and associated features are referred to as *Bonito-style architecture.* Great houses outside Chaco Canyon often are called *outliers* in reference to their spatial relationship to the Canyon (Fig. 1).

A number of models have been developed to explain the rather dramatic appearance of these imposing structures across an arid, agriculturally marginal landscape. Early Chacoan explanations focused on the canyon. More recent work has recognized that relationships must have existed between the canyon and the outliers and that these relationships may have been an important part of the *raison d'être* of Bonito-style architecture in both areas. Neither the precise nature of the relationship between Chaco Canyon and the outliers nor the function of Bonito-style architecture within outlying communities is well understood, however. How and why did Bonito-style architecture appear in outlier communities? The broad similarities that allow for the definition and recognition of Bonito-style architecture at sites throughout the greater San Juan Basin strongly suggest the form is not the product of independent invention. What does the appearance of Bonito-style architecture entail for relationships between outliers and Chaco Canyon and for the social structure of the outlier communities themselves? In the study presented here, data from 61 great houses in 55 outlier communities are compared in order to investigate these questions. The analysis is based on the premise that outlier great house similarity should reflect a Chacoan source for Bonito-style architecture and diversity should reflect the converse. Results indicate that tremendous diversity exists within the confines of what is considered Chacoan. A variety of relationships probably existed between outlier communities and Chaco Canyon, and a range of explanatory models may be necessary. Construction of Bonito-style architecture at the local end of the spectrum is likely related to community ritual and power issues. Stein and Lekson's (1992) concept of ritual landscape and Renfrew and Cherry's (1986) peer–polity interaction model explain how Bonito-style architecture may have spread across a wide area without necessitating direct contact with Chaco Canyon.

THE CHACO ANASAZI

The geological depression known as the San Juan Basin covers approximately 40,000 sq. km in northwest New Mexico and adjacent parts of Colorado, Utah, and Arizona. The basin's climate is semiarid, with high diurnal and annual temperature

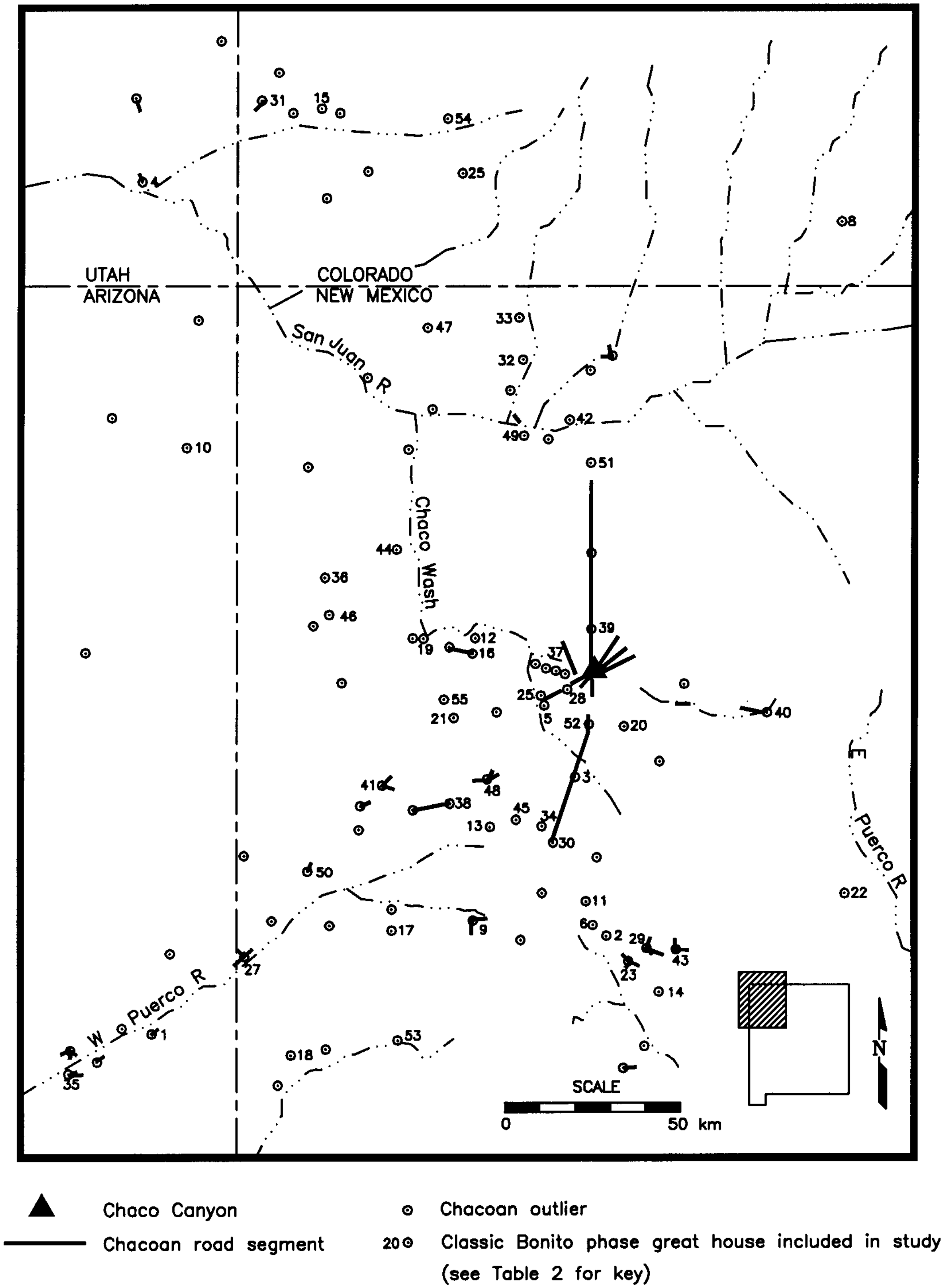

FIG. 1. Location of Chaco Canyon and Classic Bonito phase outlier communities across the San Juan basin and adjacent areas (based on data from Fowler et al. 1987; Marshall et al. 1979; Marshall and Sofaer 1988; and Powers et al. 1983).

variation and low, biseasonal precipitation. Sedimentary deposits have been carved by wind and water into landforms such as mesas, buttes, and canyons. This area was home to the Chaco Anasazi, who emerged in the tenth century as heirs to cultural traditions extending back hundreds of years. Many of the characteristics of Chacoan culture, including grayware pottery; a reliance on cultigens; and aggregated villages with large, communal pit structures appear as early as the Basketmaker III period (500–700 A.D.) (Wills and Windes 1989). The earliest construction at Chaco Canyon great houses dates to the late Pueblo I period (850–900 A.D.) (Windes and Ford 1992:77). Chacoan florescence in Chaco Canyon and the San Juan Basin spans the Pueblo II (900–1100 A.D.) and early Pueblo III (1100–1140 A.D.) periods. Researchers with the Chaco Center, a long-term cooperative venture between the University of New Mexico and the National Park Service, have subdivided the Chacoan heyday into the Early (900–1040 A.D.), Classic (1040–1100 A.D.), and Late (1100–1140 A.D.) Bonito phases (Windes 1987:244). The Bonito phases are, in general, characterized by construction of masonry pueblos, agricultural intensification, increasing site density, and production of decorated whiteware and corrugated grayware ceramics. Most outlying Chacoan great houses were founded in the Classic Bonito phase. Tree-ring dates are available for sites in Chaco Canyon and for a few outlying great houses, but the dating of most outliers and communities is based on surface ceramics. Ceramics are used as temporal markers for local phase schemes.

Chaco Canyon

The Bonito phases are represented in Chaco Canyon by great houses (Lekson 1984) and small house sites (McKenna and Truell 1986). Great houses are large, massive, usually multiple-storied structures built in planned construction episodes (Fig. 2). Core-and-veneer architecture is typical of great house construction (Lekson 1984:21; Vivian and Mathews 1965). A number of veneers, or facing styles, are recognized (Hawley 1934, 1938; Judd 1927, 1964; Lekson 1984:17–19). Great houses exhibit larger rooms and higher roofs than small house sites. Most great houses contain enclosed kivas or circular rooms constructed inside rectangular rooms. There are at least four great-house construction episodes within the canyon. During the Late Pueblo I period and the first part of the Early Bonito phase, construction was initiated at Una Vida, Pueblo Bonito, and Peñasco Blanco (Lekson 1984:64–66; Windes and Ford 1992:77). During the latter part of the Early Bonito phase, additions were made to these three structures, and construction was begun at Hungo Pavi, Chetro Ketl, and Pueblo Alto (Lekson 1984:66–70). Construction reached its zenith during the Classic Bonito phase with the building of Pueblo del Arroyo and additions to Pueblo Bonito, Peñasco Blanco, Hungo Pavi, Chetro Ketl, and Pueblo Alto (Lekson 1984:70–72). During the Late Bonito phase, Wijiji, New Alto, Casa Chiquita, Kin Kletso, and Tsin Kletzin were built (Lekson 1984:72). These buildings differ in layout from earlier great houses; the latter four are discrete, new structures exhibiting blocky *McElmo-style* masonry. The estimated floor area of Classic Bonito phase canyon great houses ranges from 8,025 m^2 (Hungo Pavi) to 23,395 m^2 (Chetro Ketl); McElmo-style great houses are much smaller, with floor areas ranging from 1184 m^2 (Tsin Kletsin) to 1,460 m^2 (Casa Chiquita) (Powers et al. 1983:Table 41). All canyon great houses are constructed to face the south/southeast, a pattern common to many Anasazi sites. Because prevailing winds are from the northwest in the San Juan Basin, a southeast exposure would have ensured that trash middens in front of the pueblo were downwind. A southern exposure would have taken advantage of the low, southern winter sun angle, helping keep rooms warm and light during colder seasons.

Great houses often are associated with one or more great kivas—large, semisubterranean circular structures usually considered to represent communal, public, integrative architecture. Great kivas in Chaco Canyon range between 14 and 19 m in diameter, with an average diameter of 16 m. Great kiva size does not appear to be related to associated great house size (Pearson's $r = 0.107$ for $n = 5$). All Classic Bonito phase canyon great houses except Pueblo Alto and Pueblo del Arroyo are associated with great kivas, but not all great kivas are associated with great houses. At least three great kivas in Chaco Canyon are associated with small house sites; these include: Casa Rinconada, on the south side of the canyon across from Pueblo Bonito and Chetro Ketl (Vivian and Reiter 1960); an unnamed great kiva opposite Wijiji (Vivian 1990:294); and an unnamed great kiva at small site 29SJ1253 (McKenna and Truell 1986:238; Marshall et al. 1979:273).

Many canyon great houses, including Peñasco Blanco, Pueblo Alto, Pueblo Bonito, and Chetro Ketl, are associated with earthworks, formally constructed platforms or berms made of trash, construction debris, or sterile materials (Lekson 1984:74; Windes 1987:561–667). Road segments, or cleared, linear alignments are associated with all Classic Bonito-phase canyon great houses except Una Vida (Kincaid 1983; Nials et al. 1987; Roney 1992; Vivian 1997; Windes 1987:529–555). Ranching, erosion, and other disturbances in the canyon may well have obscured additional road traces in some areas (Vivian 1983). Great houses, great kivas, earthworks, and road segments form the group of features collectively referred to as *Bonito-style architecture,* following the term that originated with Gladwin (1945).

There are hundreds of small-house sites in the canyon dating to the Bonito phases (Hayes et al. 1981; McKenna and Truell 1986). Small-house sites are single storied, with relatively few (i.e., less than 25) rooms. They differ markedly in layout from great houses—small-house sites do not exhibit planned construction but appear to have grown by accretion. Single or compound masonry walls characterize wall construction, although core-and-veneer construction is occasionally present. Like great houses, small-house sites have formalized kivas, but they may also contain pit rooms of variable design. Trash middens, but not earthworks or roads, are associated with small-house sites. Small-house sites tend to be located on the south side of Chaco Canyon.

The Outliers

Thanks largely to broad regional survey efforts during the 1970s and 1980s, close to 100 Chacoan outliers are currently known from the San Juan Basin and surrounding areas (Fig. 2) (Fowler et al. 1987; Marshall et al. 1979; Marshall and Sofaer 1988; Powers et al. 1983). At least 73 of these are documented as associated with communities. Outlier great houses and communities exhibit substantial spatial variability (Fig. 3). Each outlier contains, at minimum, a massive, large-roomed great house that usually exhibits multiple stories and core-and-veneer masonry. One or more great kivas, earthworks, and road segments may also be present. As in Chaco Canyon, the term "*Bonito-style architecture*" refers to these features collectively (Marshall et al. 1982:1227–1230). Spatial and temporal variability among outliers comprise the basis of Marshall et al.'s (1982:1231) distinction between "ancestral" outliers, in which Bonito-style

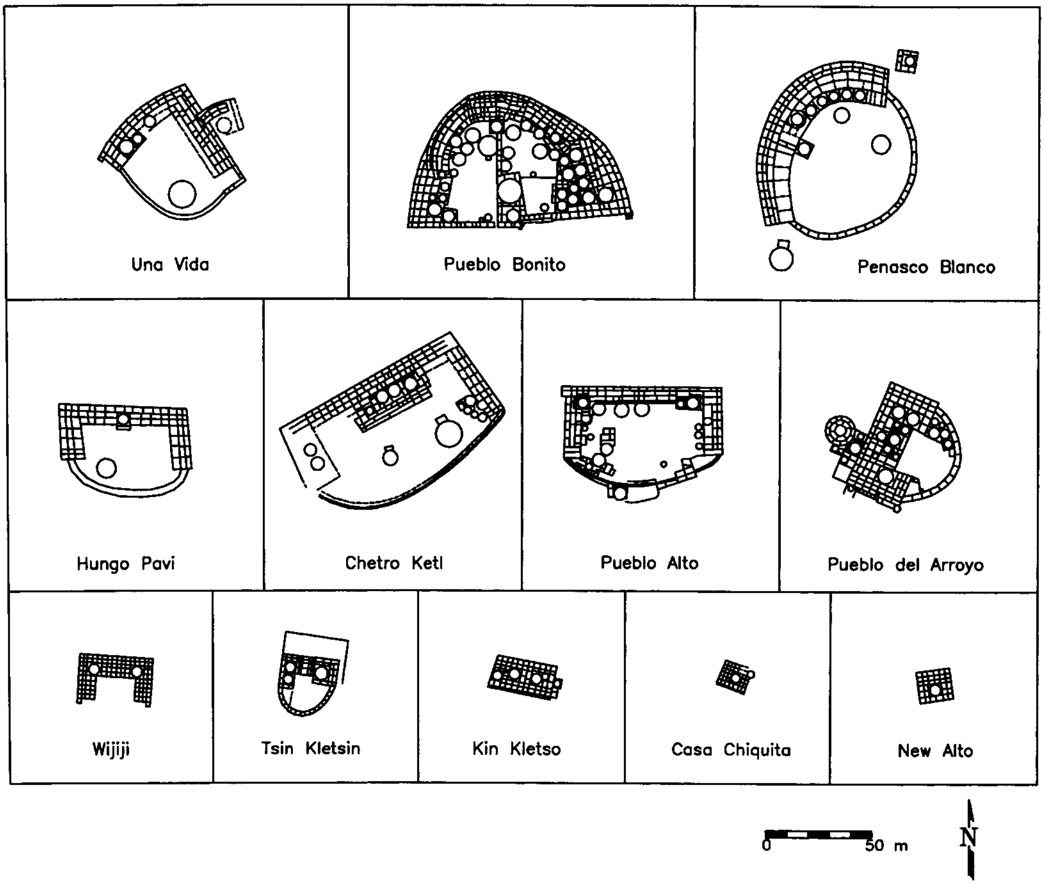

FIG. 2. Twelve Chaco Canyon great houses (after Lekson 1984). Although the plans represent the structures' ultimate configurations, only the Classic Bonito phase portions of Una Vida, Pueblo Bonito, Peñasco Blanco, Hungo Pavi, Chetro Ketl, Pueblo Alto, and Pueblo del Arroyo were used in the analysis.

architectural elements were introduced into communities that had existed for several previous centuries, and "scion" outliers, which were established as Chacoan colonies during the Classic Bonito phase. Existing communities tend to be large and dispersed over a wide area, whereas scion communities are small and tend to be concentrated around the great house.

Like canyon great houses, outlier great houses tend to be oriented toward the south/southeast (Van Dyke 1998:219). Outlier great house floor area is extremely variable, ranging between 145 m^2 (Halfway House) and 15,030 m^2 (Aztec West) (Powers et al. 1983:Table 41). Size does not correlate inversely with distance from Chaco Canyon, however. Powers et al. (1983:313–315; 344–345) defined three great house size classes and used that framework to argue that great houses could represent a three-tiered, integrated settlement system.

Although outlier great kiva diameters range between 12 and 22 m, most great kiva diameters fall within the confines of 15 to 17 m. Several communities contain multiple great kivas. Great kivas are more likely to be absent in outliers within 40 or 50 km of Chaco Canyon (Van Dyke 1998:

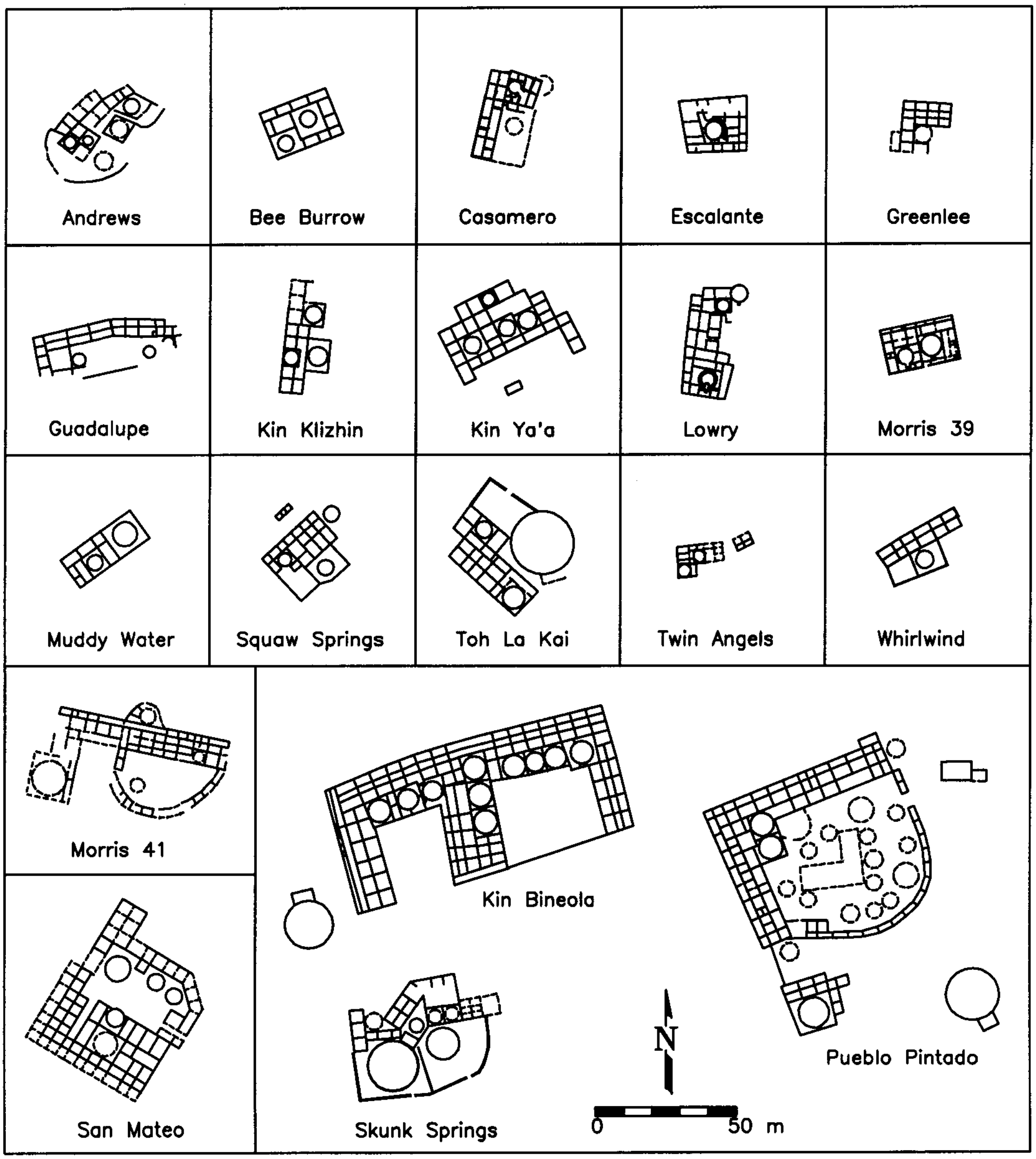

FIG. 3. Examples of Classic Bonito phase outlier great houses included in the analysis, illustrating the structures' spatial diversity (after Carlson 1966; Marshall et al. 1979; Martin 1936; Morris 1939; Peckham 1969; Pippin 1987; Powers et al. 1983; Sigleo 1981; Van Dyke 1999).

215–217) A Mann–Whitney *U* test rejected the null hypothesis of no relationship between great kiva presence/absence and distance from Chaco Canyon with a probability value of 0.038. Outliers lacking great kivas tend to be located relatively close to Chaco Canyon, suggesting that relationships between Chaco Canyon and outlier communities changed as distance increased from Chaco Canyon. Possibly people living relatively near to Chaco Canyon traveled to the canyon for ritual activities and hence did not need great kivas in their own communities.

The presence of roads and earthworks is more likely at outliers in the southern part of the San Juan Basin (Van Dyke 1998: 218–219); however, outlier surveys of the 1970s and early 1980s (Marshall et al. 1979; Powers et al. 1983) predate the systematic recognition and recording of outlier earthworks, and much of the work that has recognized these features (Fowler et al. 1987; Marshall and Sofaer 1988) has been concentrated in the southern part of the basin. Stein and Lekson (1992) have suggested that modifications such as roads and earthworks are ubiquitous to outliers and represent a ritual Chacoan landscape focused on great houses. Where they are present, earthworks define the space in front of the great house. This barrier is symbolic rather than practical, however. The recognition that roads link some of the great house communities with the canyon was part of the impetus for the recognition of a Chacoan system. With the exception of the North and South Roads, many roads can be located only in short segments near outlier communities, calling into question the assumption that the roads define and link a Chacoan system (Roney 1992).

The pattern of large, Bonito-style structures with associated communities, great kivas, and road segments does not stop at the edge of the San Juan Basin. There are large sites with Bonito-style structures in northeast Arizona and southeast Utah; the relationships between these sites to Chaco Canyon and to outliers within the basin are subject to debate.

EXPLAINING THE DISTRIBUTION OF BONITO-STYLE ARCHITECTURE

Relationships between canyon and outlier Bonito-style architecture have long been a focus of archaeological inquiry (Roberts 1932; Martin 1936; Morris 1939; Gladwin 1945). Chaco Canyon looms large in popular and archaeological consciousness in part because of the role played by Chaco in the history of the development of Americanist archaeology. Further, canyon great houses constitute the largest and most concentrated appearance of Bonito-style architecture. Given these factors, it is not surprising that Chaco Canyon is usually envisioned as the hub from which Bonito-style architecture emanated. However, there are several possible explanations for the spread of the architecture. The appearance of Bonito-style architecture at outliers as the result of direct involvement on the part of a centralized, Chacoan entity is only one of these. Alternatively, local people could have been emulating Bonito-style architecture they saw either at Chaco or in neighboring communities, or Bonito-style architecture could have been imported into Chaco Canyon from its origins in outlier communities. The first two possibilities are considered here in light of a range of competing models for the Chacoan system.

Competing Explanations for the Chacoan System

Contemporary explanations for the construction of Bonito-style architecture in Chaco Canyon and in outlier communities are numerous and contradictory (Sebastian 1992:82–97; Vivian 1990:391–419). Although most models were developed to explain canyon rather than outlier community dynamics, the models do have either inferred or directly stated implications for relationships between the outliers and Chaco Canyon. A Chacoan origin for outlier great houses is in accord with models proposed by Vivian (1989, 1990) and Wilcox (1993). In both of these scenarios, people from Chaco are directly responsible for the construction of Bonito-style architecture outside Chaco Canyon. Vivian (1989, 1990), building upon the work of Kluckhohn (1939), contends that great houses and small-house sites in Chaco Canyon represent two separate but coexistent egalitarian cultural traditions. Grounded in principles of dualism, the San Juan tradition gave rise to great houses organized in terms of a rotating sequential hierarchy (after Johnson 1982). By contrast, within the small-house site Cibola tradition, social relationships were organized in terms of lineages. For Vivian, outliers were established when representatives from canyon groups moved into the basin in search of better farmland, sometimes joining existing communities.

Wilcox (1993) proposes a military Chacoan state replete with social hierarchy and economic and religious centralization. Canyon great houses are barracks, and outliers are military installations established to obtain agricultural tribute from and retain control over the countryside. Great kivas are focal points for tribute collection, and roads are for the efficient movement of Chacoan armies as they go about this business. However, there are serious material problems with envisioning Chaco as a state. The highly visible hallmarks of centralization present in other ancient states, including a unified currency, standardized weights and measures, and a system of record keeping (Runciman 1982:361), are entirely lacking in the Chacoan system.

In contrast with the direct canyon origins for outliers suggested by the work of Vivian and Wilcox, a more ambiguous view is proffered in Chaco Center and related models (Judge 1979, 1989; Judge et al. 1981; Schelberg 1984; Toll 1984, 1985). For these authors, canyon-directed outlier construction does not seem mandatory, yet direct interaction between the outliers and Chaco Canyon remains an important component of the outliers' *raison d'etre*. Chaco Center archaeologists (Judge 1979; Judge et al. 1981; Powers 1984; Powers et al. 1983; Schelberg 1984) originally considered the canyon as the center of a redistribution network for subsistence goods; the system protected the San Juan Basin Anasazi against crop shortfalls. Outliers were linked to the canyon in a relationship that was primarily economic, although it may have been legitimated by a ritual veneer. Adaptation to the environment is seen as the motivating force behind the evolution of a Chacoan regional system. A ranked social hierarchy involving managerial elites who control economic and ritual activities is envisioned. In Judge's later (1989) "pilgrimage fair" model, redistribution is held to be responsible for the initial development of Chaco, but control of turquoise is the key to the canyon's growth into a ritual center under the purview of canyon-based elites.

Toll (1984, 1985) sees Chaco as an egalitarian system characterized by the movement of goods to counter environmental shortfalls. Periodic gatherings took place at Chaco without an aegis of elites. "Alarming" quantities of smashed utility vessels in the earthworks at Pueblo Alto (Toll 1985:185) are the detritus of cyclical feasting (Toll 1985:369-406). Large quantities of trachyte-tempered pottery traveled from the Chuskan slope to Chaco Canyon, but Chaco appears to have been primarily a terminus rather than a redistribution center for the pottery (Toll 1984:130) as well as Chuskan lithic materials (Cameron 1984; Jacobson 1984).

At the opposite end of the explanatory spectrum, the models of Mathien (1993), Sebastian (1992), and Stein and Lekson (1992; Lekson 1991) allow for local development of Bonito-style architecture. The canyon is the primary focus of Mathien's and Sebastian's work, but both authors suggest outlier Bonito-style architecture might reflect aggrandizing strategies undertaken by local leaders seeking to establish alliances. Following the work of C. Smith (1976a, 1976b), Mathien (1993) focuses on exchange as a means of understanding Chacoan socioeconomic organization. Prior to 1050 A.D., exchanged items were not rare but were sometimes unpredictable in availability. The subsequent introduction of scarce prestige items led to a bounded system controlled by a "big man." In a Chacoan bounded system, scarce and critical resources could have been exchanged between parties in a situation similar to a Melanesian "Kula ring" (C. Smith 1976b). Control of water and better farmland would have given some basin Anasazi economic power during environmentally difficult times. Those in less fortunate circumstances could have contributed their labor to construct roads or great houses in exchange for food.

Nascent Anasazi social differentiation gave rise to client–patron relationships in Chaco Canyon in a model developed by Sebastian (1992). Correlations between estimated corn crop yields and great house construction dates form the basis of a scenario in which the building of the canyon great houses assisted emerging canyon elites in solving problems of leadership. Architecture, roads, and earthworks utilized labor debts, constituted physical evidence of leaders' power, and ultimately became a medium of competition between elites seeking to impress and attract followers. Outlier communities represent indigenous developments of patron–client relationships similar to those evolving in Chaco Canyon, and canyon elites established alliances with outlier leaders.

Stein and Lekson (1992) directly address the appearance of Bonito-style architecture in outliers with a model that can incorporate a diverse spectrum of canyon–outlier relationships. Communities dating from the eleventh and twelfth centuries with Bonito-style architecture are found outside the San Juan Basin over a large area difficult to view as one coherent system (Lekson 1991:46). Hence, characteristic outlier attributes may simply represent a late Pueblo II–early Pueblo III pan-Anasazi pattern. Bonito-style elements are seen as symbolic links connecting outliers in a religious *koine* that crosscuts ethnic or linguistic boundaries. Stein and Lekson conceive of a Chacoan ritual landscape in which great houses, great kivas, road segments, and encircling earthworks had symbolic meaning that was replicated over a wide area. The spatial extent and meaning of Bonito-style architecture is not necessarily congruent with the extent and the nature of Chacoan regional interaction (Lekson 1991:32).

Style and Social Identity

By definition, Bonito-style architecture in Chaco Canyon and in outlier communities involves a number of shared, easily recognizable architectural characteristics. A diverse range of social relationships between outlier and canyon great houses may be represented by the stylistic affinities among the structures. The complicated connections between style and social identity have been the focus of considerable recent investigation (Carr and Neitzel 1995; Conkey and Hastorf 1990; Hegmon 1992; Stark 1998). Stylistic choices may be emblemic, intentional attempts to communicate group membership (Wiessner 1983, 1984, 1985, 1990) or enculturative, passive by-products of shared learning frameworks (Sackett 1982, 1985, 1990). Bonito-style architecture obviously has a great deal of communicative, symbolic potential, but any investigation into the nature and directionality of possible symbolic messages also must address the critical issue of Chaco Canyon involvement in the construction of the architecture in outlier communities. First, the nature of social connections between canyon and outlier Bonito-style builders must be assessed; only then can possible communicative or symbolic purposes be examined. In other words, the enculturative information contained in the architecture must be teased out before its symbolic content can be meaningfully examined.

For Carr (1995a, 1995b), visibility is the key to the distinguishing among communicative and enculturative stylistic attributes. Artifacts and features with high visibility, such as polychrome bowls or monumental architecture, have a high communicative potential. In contrast, patterning among low-visibility artifacts and features, such as plainware vessels and domestic architecture, is likely to reflect shared enculturative backgrounds. Following Carr's (1995b) logic, because Bonito-style architectural forms are highly visible, they are likely to have had communicative or emblemic purposes. However, this does not preclude the possibility that enculturative information also is contained in the structures. Regardless of the high-visibility communicative potential of Bonito-style architecture, it should be possible to look at the low-visibility aspects of construction to see if the builders of canyon and outlier structures relied upon shared learning frameworks. The French school of technological style, or *technologie* (Lechtman 1977; Lemonnier 1986), avoids the problematic issue of the intentionality of stylistic communication by focusing not on the finished product but rather on the learning frameworks and sequence of specific creative activities used in production. Learning-framework information should be reflected in the internal construction and organization of Bonito-style architectural features.

The many possible relationships between the builders of canyon and outlier Bonito-style architecture can be organized as an explanatory continuum. In the ensuing analysis, I focus on the opposing ends of this continuum. Although this is admittedly a somewhat reductionist approach, it does facilitate the empirical evaluation of possible relationships between canyon and outlier builders. Thus, possible canyon–outlier builder relationships are organized into two camps: information about the construction of Bonito-style architecture may have traveled directly from Chaco Canyon to outlier communities, or people in outlier communities may have attempted to emulate the architecture they saw in Chaco or in neighboring communities. The first possibility is considered under the rubric of *directed construction;* the second is considered under *local construction.* A third possibility—that Bonito-style architecture originated in outlier communities and traveled to Chaco Canyon—is not addressed in this study. The reasons behind the spread of Bonito-style architecture and the mechanisms and directionality of the flow of information are of considerable importance for evaluating some of the existing Chacoan explanatory models reviewed above.

Directed construction. If the information for construction of Bonito-style architecture at outliers emanates from a central, Chacoan source, several kinds of relationships between the canyon and the outliers are possible. First, the architecture could have been built by migrants from Chaco Canyon, à la Vivian (1990). In this case, Bonito-style architecture represents group identification with Chaco Canyon that may or may not be conscious. Colonists probably would have maintained social ties with Chaco and may or may not have been considered independent of Chacoan social authority. If Bonito-style architecture at outliers represents the intrusive presence of migrants from Chaco Canyon into extant basin communities, the architecture reflects a specific and probably conscious Chacoan aesthetic juxtaposed with local Anasazi traditions.

Second, Bonito-style architecture in outlier communities might represent information conveyed by specific individuals from Chaco Canyon who did not make the community their permanent home.

Masons may have traveled from the canyon to the outliers for the express purpose of designing and constructing Bonito-style architecture in the communities. Masons might have been members of a Chacoan elite or attached specialists serving Chacoan elites (Ames 1995). Ancient political authorities often established military and governmental installations in high places, constructing visually massive, vertically impressive buildings accompanied by artwork that dramatized the regime's inevitability and continuity with the natural order. If Bonito-style architecture is a physical manifestation of Chacoan domination, we might expect the kinds of spatial practices and representations documented in other parts of the world as concomitant with political expansion (Alcock 1993; A. Smith 1996). A nascent Chacoan polity placing its stamp upon local communities coincides with Wilcox's (1993) concept of a Chacoan state.

Chacoan masons may have constituted a relatively independent guild or group that possessed exclusive knowledge sought by locals. These masons could have been invited to ply their trade in outlier communities, or local would-be builders could have traveled to Chaco to consult with them. Information about Bonito-style construction might have been available to locals who traveled to Chaco to participate in ritual gatherings, as envisioned by Toll (1985) and Judge (1989). If Chacoan elites sought to expand an elite network to include the leaders of outlier communities, perhaps masons were sent to work for those leaders on a part-time or a full-time basis as part of the consolidation of network ties.

Neighboring communities might have learned about Bonito-style architecture from one another through cooperative, rather than competitive, activities. If labor for large-scale construction projects was drawn from neighboring communities, architectural information could have moved rapidly throughout the San Juan Basin and adjacent areas in a "down-the-line" manner. Ethnographic sources suggest that large-scale construction projects are often communal endeavors for social, if not practical, reasons (Tuzin 1976).

In all these scenarios, the techniques of Bonito-style architecture were not common knowledge, but were known only to certain individuals or small groups who presumably plied their trade primarily in Chaco Canyon. If knowledge about Bonito-style construction was restricted, it is likely that individuals or factions either from the canyon or from the local community attempted to use exclusive access to that knowledge in the establishment or legitimation of power.

Local construction. At the opposite end of the spectrum of explanations for spatial similarities between the canyon and the outliers is the idea that local factions sought to emulate Bonito-style architecture visible either among their neighbors or at Chaco Canyon. A possible rationale for local emulation of Chacoan architectural forms is suggested by Renfrew and Cherry's (1986) peer–polity interaction model. According to this model, in the absence of a strong central political authority, neighboring communities observe and compete with one another. A well-developed set of prestige symbols seen in one community will appeal to neighbors, who will attempt to imitate it if their own symbolic system is less developed and does not conflict. Renfrew and Cherry (1986:8) call this process "symbolic entrainment." Kintigh (1994:134-136) suggests that the appearance of quasi-Bonito-style architectural elements such as large, unroofed great kivas at post-Chacoan sites stems from peer–polity interaction in the absence of a central, Chacoan influence. Prestige in the Cibola (Zuni) area during the thirteenth century A.D. was gained by emulating the Chacoan past. Could prestige also have been gained by emulating the Chacoan present? Application of the peer-polity interaction model to the Chacoan era is predicated on a weak central role for the canyon itself. The peer-polity interaction model is cited by Blanton et al. (1996:5) as an example of a network strategy to power. Network strategies, in which neighboring elites exchange but also compete with one another, are similar to what both Mathien (1993) and Sebastian (1992) have in mind when they discuss interaction between Chaco Canyon elites and outlier leaders. Construction of Bonito-style architecture in an attempt to foster prestige and legitimate inequalities within local outlier communities could fit either of these models.

In another twist on local emulation, Bonito-style architecture could have been built in outlier communities by Chacoan migrants who did not possess technical architectural knowledge but who sought to emulate the canyon style to emphasize their origins or ties with the canyon. People who emigrate are usually not the people who hold power in the society of their origin. Perhaps some outlier communities were founded by disenfranchised Chacoan people who attempted to replicate the great houses of the canyon but who were not privy to specific tenets of canyon architecture. If Bonito-style architecture represents a communal, symbolic statement of affinity with Chaco Canyon or with neighboring communities, this fits the perspective of Bonito-style architecture as ideational bond as put forth by Stein and Lekson (1992).

ARCHITECTURAL ANALYSIS

How do directed and local construction differ archaeologically? If outlier great houses were built according to directed Chacoan information, then they should resemble the great houses of Chaco Canyon and each other. The converse should also be true—if outlier great houses were constructed under entirely local auspices, they should exhibit great variability, differing both from canyon great houses and from each other. As discussed above, because external, high-visibility similarities are likely to contain communicative information, they are not useful for purposes of analysis. However, low-visibility aspects of construction should contain enculturative information. Similarities among internal, low-visibility attributes of great house architecture are likely to indicate shared learning frameworks. Local emulation should be distinguishable from directed, Chacoan construction in that although the general form and appearance of Bonito-style architecture might be emulated, specific, internal precepts of the style cannot. If Bonito-style architecture were constructed under local auspices, internal details of outlier great houses should differ from each other and from internal details of canyon great houses. Furthermore, if architectural information was transmitted in a down-the-line fashion from Chaco Canyon, internal variable diversity should increase with increased distance from Chaco Canyon.

Following these assumptions, seven Classic Bonito phase Chaco Canyon great houses were used as the template against which contemporaneous outlier great houses were compared. Using the fine-grained temporal resolution afforded by tree-ring dates, only those canyon great house configurations dating to the second half of the eleventh century were included in the analysis. Five internal, or low-visibility, architectural variables characteristic of canyon great houses were chosen for comparison. These include core-and-veneer walls, banded facing, symmetry, elevated kivas, and kiva/room ratio (Table 1). Core-and-veneer walls and banding facings are particularly likely to represent common learning frameworks. Symmetry, elevated kivas, and kiva/room ratio com-

TABLE 1
Classic Bonito-Phase Canyon Great Houses and Variables Used in the Analysis[a]

Great house	Core-and-veneer	Banding	Symmetry	Elevated kiva	K:R ratio
Chetro Ketl	1	1	1	1	0.028
Hungo Pavi	1	1	1	1	0.007
Peñasco Blanco	1	1	1	1	0.033
Pueblo Alto	1	1	1	0	0.115
Pueblo Bonito	1	1	1	1	0.047
Pueblo del Arroyo	1	1	1	1	0.052
Una Vida	1	1	1	1	0.038

[a] Based on data in Lekson (1984); 0 = absent, 1 = present.

municate aspects of social organization. All five are aspects of construction that could not be easily emulated by outsiders lacking access to the specifics of great-house construction or layout. The choice of internal variables was mitigated by the fact that the study dealt mainly with surface data. Thus, potential internal variables such as kiva features, or technical aspects of construction such as mortar composition or stone shaping, could not be considered given the constraints of the data. Following a review of the data set and methods used in the analysis, each variable is explained and its results discussed in sequence below.

A total of 61 Classic Bonito phase great houses from 55 outlier communities provided a data set for examining the distribution of internal variables (Table 2; Fig. 3). Where excavation data allowed great-house temporal components or construction episodes to be separated (e.g., Guadalupe, Lowry, Wallace), only components from the Classic Bonito phase were used in the analysis. Most unexcavated great houses were dated using midden surface ceramics, although tree-ring dates were available in a few cases (e.g., Kin Bineola, Kin Klizhin). Great houses with ambiguous architectural definition or with substantial later components were omitted in order to minimize sources of error. If outlier Bonito-style architecture is a result of directed, canyon influences, then the five internal variables should be similar in their distribution across space. They should co-occur in a majority of cases. If the converse is true, and outlier Bonito-style architecture is a result of local emulation, then these variables should exhibit great disparity. Little patterning or co-occurrence should be evident. If communal labor practices led to Bonito-style architectural information being passed from community to community, then diversity among internal variables is expected to decrease as distance from Chaco Canyon increases.

In order to identify spatial patterning, internal variables were compared with each other and with region, distance in kilometers from Chaco Canyon, and great-house area. *Region* is a categorical variable assigned to each great house based on location. The greater San Juan Basin may be divided physiographically into 20 or more subregions (e.g., Marshall et al. 1979:20-22), but this level of compartmentalization yields outlier counts for each area that are too small for meaningful comparisons of the variables. Thus, three general regions were defined by means of two east–west boundaries drawn approximately at the north edge of the Chaco Plateau and the south edge of the South Chaco Slope (Fig. 4). The north (Region 1), central (Region 2), and south regions (Region 3) contain 13, 30, and 18 outlier great houses respectively. A sec-

TABLE 2
Classic Bonito-Phase Outlier Great Houses and Variables Used in the Analysis

Great house[a]	Region	Distance[b]	Area[c]	Core-and-veneer[d]	Banding[d]	Symmetry[d]	Elevated kiva[d]	Kiva:room ratio	Major references
1. Allentown	3	163.8	1813	1	—	—	0	0.053	Marshall et al. (1979); Powers et al. (1983); Roberts (1939, 1940)
2. Andrews	3	76.3	470	1	0	1	1	0.238	Marshall et al. (1970); Van Dyke (1999)
3. Bee Burrow	2	30.9	430	1	0	1	0	0.125	Marshall et al. (1979); Powers et al. (1983)
4. Bluff	1	190.1	—	1	0	0	0	—	Cameron (1996); Cameron and Lekson (1996)
5. Casa Escondida	2	17.6	346	1	1	—	0	0.143	Marshall and Sofaer (1988)
6. Casamero	3	73.0	365	1	1	0	0	0.143	Harper et al. (1988); Marshall et al. (1979); Powers et al. (1983); Sigleo (1981)
7. Cerro Prieto	3	—	1758	1	—	0	0	0.025	Fowler et al. (1987)
8. Chimney Rock	1	147.8	1461	1	—	1	0	0.036	Eddy (1977); Jeancon (1922); Jeancon and Roberts (1923); Powers et al. (1983)
9. Coolidge	3	79.5	731	1	—	1	0	0.190	Marshall et al. (1979)
10. Cove	1	133.3	300	0	—	—	—	—	Reed and Hensler (1998)
11. Coyotes Sing Here	3	66.2	349	1	—	1	0	0.133	Marshall et al. (1979)
12. Cuatro Payasos	2	35.0	378	1	—	0	0	0.071	Marshall and Sofaer (1988)
13. Dalton Pass	2	53.7	753	1	—	—	0	0.214	Powers et al. (1983)
14. El Rito	3	93.9	—	0	0	—	0	0.073	Allan and Gauthier (1976); Powers et al. (1983)
15. Escalante	1	179.5	424	1	0	0	0	0.040	Hallasi (1979); Powers et al. (1983)
16. Escalon	2	34.8	268	1	1	—	0	0.050	Marshall and Sofaer (1988); Marshall (1994a)
17. Fort Wingate	3	94.3	844	0	0	0	0	0.091	Peckham (1958); Marshall et al. (1979)
18. Gonzales Well	3	140.5	1129	1	—	—	0	—	Fowler et al. (1987)
19. Great Bend	2	49.4	409	1	—	0	0	0.375	Marshall et al. (1979)
20. Greenlee	2	17.1	250	1	0	0	0	0.067	Powers et al. (1983)
21. Grey Hill Spring	2	51.1	188	1	1	0	0	0.200	Marshall et al. (1979); Powers et al. (1983)

TABLE 2—*Continued*

Great house[a]	Region	Distance[b]	Area[c]	Core-and-veneer[d]	Banding[d]	Symmetry[d]	Elevated kiva[d]	Kiva:room ratio	Major references
22. Guadalupe	3	95.3	335	1	1	1	0	0.091	Baker (1984); Irwin-Williams and Baker (1991); Marshall et al. (1979); Pippin (1987); Powers et al. (1983); Washburn (1974)
23. Haystack	3	84.2	700	1	—	1	1	0.200	Marshall et al. (1979); Powers et al. (1983)
24. Hinkson Ranch	3	—	265	1	—	1	0	—	Fowler et al. (1987)
25. Ida Jean	1	148.0	542	1	1	1	0	0.074	Powers et al. (1983)
26. Kin Bineola	2	16.6	3360	1	0	1	1	0.050	Marshall et al. (1979); Powers et al. (1983)
27. Kin Hocho'i	3	129.6	697	1	—	0	0	0.138	Fowler et al. (1987)
28. Kin Klizhin	2	11.5	350	1	1	1	1	0.188	Marshall et al. (1979); Powers et al. (1983)
29. Kin Nizhoni	3	81.2							Marshall et al. (1979)
Upper			330	1	1	0	0	0.200	Powers et al. (1983)
Lower			305	1	0	1	0	0.200	
30. Kin Ya'a	2	50.4	864	1	1	1	1	0.100	Marshall et al. (1979); Powers et al. (1983)
31. Lowry	1	189.5	562	1	1	1	0	0.125	Kendrick and Judge (1996); Martin (1936); Powers et al. (1983)
32. Morris 39	1	91.9	403	1	0	1	0	0.050	McKenna and Toll (1991); Morris (1939); Powers et al. (1983)
33. Morris 41	1	104.0	1069	1	1	0	0	0.040	McKenna and Toll (1991); Marshall et al. (1979); Morris (1939)
34. Muddy Water	2	46.8							Marshall et al. (1979); Powers et al. (1983)
LA 10959			367	1	—	—	0	0.111	
LA 10716			387	1	—	—	0	0.067	
LA 17257			418	1	1	—	1	0.286	
35. Navajo Springs	3	189.6	760	1	0	—	0	0.063	Graves (1990); Warburton and Graves (1992)
36. Newcomb	2	81.2	448	1	—	0	0	0.077	Marshall et al. (1979)
37. Padilla Well	2	8.6	200	1	—	0	0	0.000	Marshall and Sofaer (1988)
38. Peach Springs	2	55.8	752	1	1	1	1	0.033	Powers et al. (1983)

39. Pierre's	2	12.1							Powers et al. (1983); Harper et al. (1988)
House A			265	1	0	0	0	0.200	
House B			336	1	1	0	0	0.077	
El Faro			505	1	0	0	0	0.111	
40. Pueblo Pintado	2	51.0	4415	1	1	0	0	0.168	Marshall et al. (1979); Powers et al. (1983)
41. Red Willow	2	68.6	1036	1	—	0	1	0.300	Marshall and Sofaer (1988)
42. Salmon	1	72.6	3452	1	1	1	1	0.010	Irwin-Williams and Shelly (1980); Irwin-Williams et al. (1975); Powers et al. (1983)
43. San Mateo	3	83.5	1765	1	0	0	1	0.048	Marshall et al. (1979)
44. Sanostee	2	66.2							Marshall et al. (1979)
House 1			346	1	—	1	0	0.222	
House 2			72	1	—	1	0	0.000	
45. Section 8	2	47.9	290	1	0	1	0	0.400	Marshall et al. (1979)
46. Skunk Springs	2	77.1	1530	1	—	1	1	0.095	Marshall et al. (1979); Peckham (1969); Powers et al. (1983)
47. Squaw Springs	1	109.8	440	1	0	0	0	0.176	Marshall et al. (1979); Powers et al. (1983)
48. Standing Rock	2	43.3	415	1	0	1	0	0.000	Marshall (1994b); Marshall et al. (1979); Powers et al. (1983)
49. Sterling	1	70.0	—	1	0	—	0	0.040	McKenna and Toll (1991); Powers et al. (1983)
50. Toh La Kai	2	99.8	818	1	1	0	1	0.065	Marshall et al. (1979)
51. Twin Angels	1	60.0	364	1	—	0	0	0.118	Carlson (1966); Powers et al. (1983)
52. Upper Kin Klizhin	2	15.0	351	1	—	0	1	0.040	Powers et al. (1983)
53. Village of the Great Kivas	3	120.2	349	1	1	1	1	0.111	Powers et al. (1983); Roberts (1932)
54. Wallace	1	163.5	522	0	0	1	0	0.111	Bradley (1974, 1993); Powers et al. (1983)
55. Whirlwind	2	48.5	378	1	0	0	1	0.048	Marshall et al. (1979)

[a] Numbers correspond to Fig. 4.
[b] Linear kilometers to Pueblo Bonito.
[c] Total roofed area in two dimensions (square meters).
[d] 0 = absent; 1 = present.

ond categorical variable, *north/south,* also was used to compare the outliers in the San Juan/Animas Valley and points further north (Region 1) to those in the central and south part of the San Juan Basin (Regions 2 and 3). *Distance* is a metric variable referring to kilometers between each outlier great house and Chaco Canyon, for which Pueblo Bonito is used as the arbitrary central point. The metric variable *area* was assigned to each great house on the basis of two-dimensional roofed area in square meters. Canyon great houses are at the large end of the great-house size continuum, so inclusion of this measure helps assess whether any internal variables are common only to very large great houses. Measurements were made on great-house drawings scanned or digitized into AutoCAD. Plazas were excluded because not all great houses have walled or well-defined plazas and plazas can inflate the areal measurements for great houses without addressing the reasons behind this difference. Multiple stories were also excluded for the purposes of this analysis because outlier upper story estimates based on surface data are unreliable and quite variable.

Comparisons of dichotomous categorical variables, including presence/absence of core-and-veneer walls, banding, symmetry, and elevated kivas, were made using Fisher's exact test. Comparisons of the polytomous categorical variable, region, were made using Pearson's chi-square test. Comparisons of metric variables, including distance from Chaco Canyon, great-house area, and kiva/room ratio, were made using the Mann–Whitney *U* test and Kruskal–Wallis one-way analysis of variance. Probabilities resulting from these comparisons are presented in Table 3; *p* values of .05 or less are considered statistically significant. Selection, analysis, and results for each of the five internal variables are discussed below.

Core-and-Veneer Walls

Core-and veneer walls are described by Lekson (1984:21) as "hallmark(s) of Chacoan building" and are present at all seven Classic Bonito phase canyon great houses. Core-and-veneer walls consist of two parallel simple walls separated by a space filled with various materials. For "fill core" core-and-veneer walls, this space is filled with mud, earth, trash, or rubble placed in the cavity after several courses of wall were completed. For "solid core" core-and-veneer walls, rubble is laid between the two facing walls as the facings are built. Chacoan walls rely on width, rather than other techniques, such as buttressing, for stability. The core-and-veneer technique may have been developed to facilitate the construction of very wide ground floor walls that could bear the load of the multiple stories above; the widths of upper-story walls were successively reduced (Lekson 1984:15). Although core-and-veneer construction provides functional benefits enabling the creation of load-bearing walls, the technique is not a necessary requirement for construction of multiple-story structures. Early, multiple-story construction portions of Una Vida, Peñasco Blanco, and Pueblo Bonito were built of simple and compound masonry (Judd 1964:58; Lekson 1984:21–22, 90–91, 104). Core-and-veneer construction is considered an internal architectural characteristic because wall interiors would not have been readily visible to casual passers-by. It is unlikely that core-and-veneer construction was spontaneously independently invented throughout the San Juan Basin. If core-and-veneer construction is considered evidence of a relationship with Chaco, then the presence of this technique at nearly all of the outlier great houses in the sample constitutes support for directed, Chacoan construction.

Despite the reduced condition of some

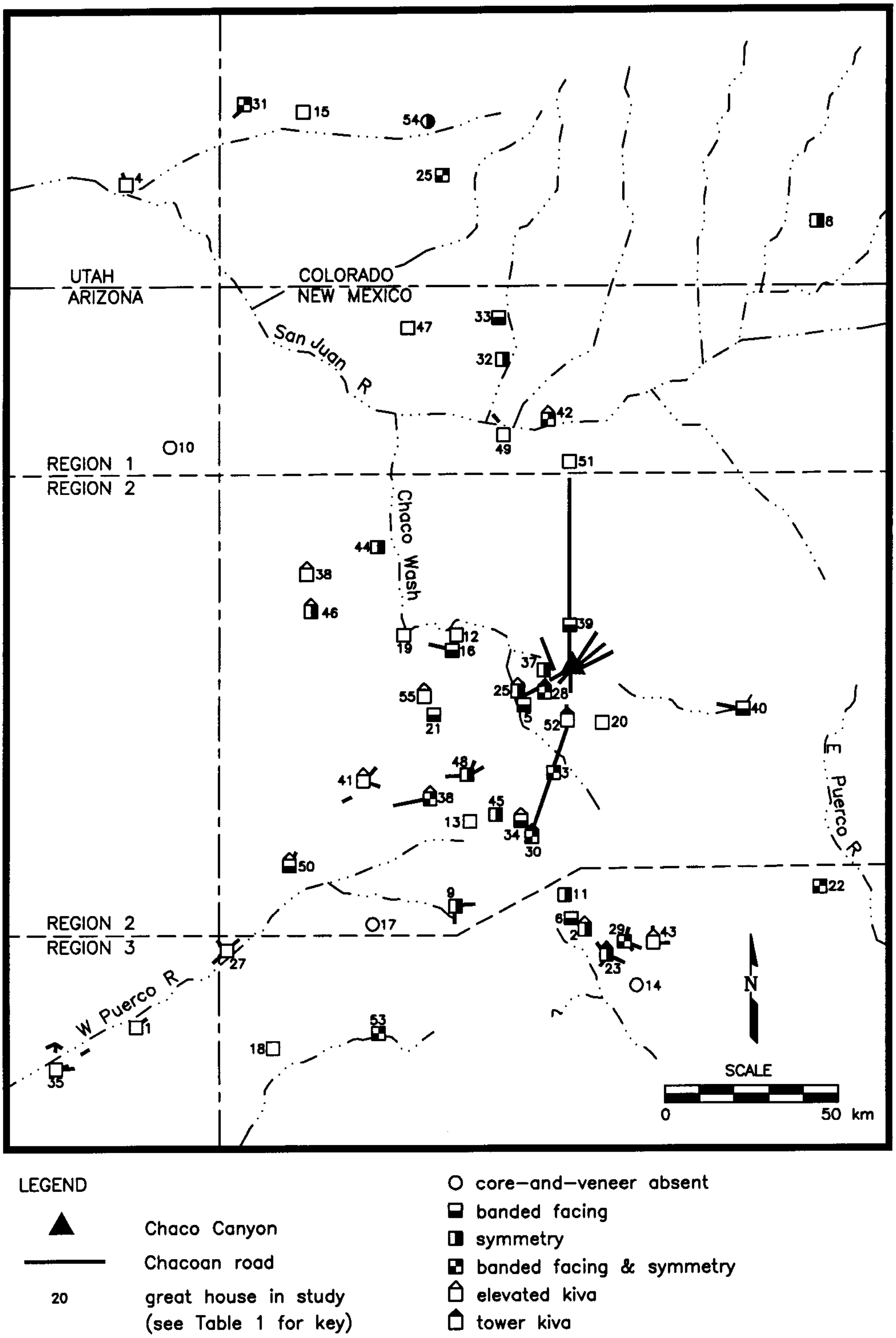

FIG. 4. Distribution of five internal variables among Classic Bonito phase outlier great houses included in the analysis.

TABLE 3
Probability Values for Cross-Tests of Internal Variables

	Region	N/S	Dist.	Area	Core-and-veneer	Band.	Symm.	Elev. kiva
Core-and-veneer	0.113[b]	0.196[a]	**0.037**[e]	0.930[c]	—	—	—	—
Banding	0.733[b]	1.000[a]	0.838[c]	1.000[c]	0.230[a]	—	—	—
Symmetry	0.600[b]	0.742[a]	0.419[c]	0.845[c]	1.000[a]	0.724[a]	—	—
Elevated Kiva	0.475[b]	0.713[a]	0.292[c]	**0.009**[e]	1.000[a]	0.476[a]	0.754[a]	—
Kiva:room ratio	0.148[d]	**0.050**[e]	0.524[d]	0.378[d]	0.886[c]	0.831[c]	0.806[c]	0.528[c]

[a] Probability value for Fisher's exact test.
[b] Probability value for Pearson's chi-square test.
[c] Probability value for Mann–Whitney *U* test.
[d] Probability value for Kruskal–Wallis one-way ANOVA.
[e] Statistically significant value (all are Mann-Whitney *U* tests).

of the great houses in the sample, core-and-veneer construction is recorded as present at all except four—El Rito, Fort Wingate, Cove, and Wallace (Fig. 4; Table 2). El Rito, Fort Wingate, and Wallace are all multiple-story structures. El Rito exhibits masonry similar to Hawley's (1934, 1938) Type 1 found at Una Vida (Powers et al. 1983: 216, 222–224), suggesting that the structure actually dates to the Early Bonito–phase. The only visible masonry at Fort Wingate is compound (Marshall et al. 1979:155), but the reduced state of the rubble mound makes it impossible to say with certainty that core-and-veneer masonry is absent. Both Cove and Wallace have firm occupations during the Classic Bonito–phase but lack core-and-veneer masonry. At Cove, the rubble mound is reduced, but Reed and Hensler (1998) nevertheless were able to identify compound masonry. Excavations at Wallace have determined that Pueblo II rooms were built of simple and compound masonry (Bradley 1974; Powers et al. 1983:163). When the presence/absence of core-and-veneer masonry was compared with the other variables, it was found to be significantly associated with the dependent variable distance (Table 3), reflecting the fact that the four cases where core-and-veneer masonry is absent fall between 93.9 km (El Rito) and 163.6 km (Wallace) from Pueblo Bonito. These findings would seem to support the directed, Chacoan construction of most Classic Bonito phase outlier great houses, with the exception of a handful in the distant hinterlands. However, no significant associations were found between core-and-veneer masonry and any other variables.

Banded Facing Style

Classic Bonito phase masonry has a banded appearance created by the use of alternating bands of thin, tabular sandstone and thick, blocky sandstone. The use of sandstone by canyon and outlier great house builders reflected the material's availability and its functional and aesthetic properties. In Chaco and many outlier locations, both types of sandstone are locally available in Tertiary or Cretaceous sedimentary exposures. The soft sandstone is easily worked, and both soft blocks and hard tabular pieces are easily stacked, facilitating construction and stability of tall, multistoried walls. Sandstone facings would have provided smooth surfaces and sharp angles for plastering, and tabular sandstone is especially conducive to producing the banded appearance of much Chacoan architecture.

Banding is exhibited by Types 2 and 3 in the widely adopted Judd/Lekson facing-style typology (Lekson 1984:17–19). Banding is not a necessary outcome of building with coursed sandstone, as it does not characterize all canyon great-house masonry. However, banded veneers may have provided some functional benefit. Core-and-veneer masonry with Type 2 facing represented a technological improvement over the earlier, simple or compound Type 1 masonry because the use of more spalls than mortar in the joints strengthened walls by decreasing mortar exposure and by transferring most of the load of the wall from the core to the facing. Increased stone-on-stone contact resulted in stronger walls (Lekson 1984:23; Reiter 1933:67). Stone-on-stone contact is maximized in Type 4 masonry, however, which lacks the banded appearance of Types 2 and 3.

Mindeleff (1989:140) suggested banded facings were inspired by the juxtaposed seams of tabular and blocky sandstone in the walls of Chaco Canyon or were an accidental result of using the material expediently at hand. However, Powers et al. (1983:317) note that veneer variability evident through time within one structure or between adjacent structures indicates that building material did not determine style. A raw materials-based interpretation for banding does not explain why banding was intentionally created at some great houses where suitable tabular and blocky sandstone were not readily available. At Casamero (Sigleo 1981:3), limestone blocks and chinking were used to produce banding, suggesting that the creation of banded veneers must have been at least partially an aesthetic choice. Banding may have been intentionally created to in some way symbolize "Chaco-ness" or "great house," or the style may have been part of the received knowledge of Chacoan builders.

Banded veneers are an excellent low visibility attribute because most canyon great-house walls were probably coated with mud or plaster both inside and out (Lekson 1984:29). Excavated outlying great houses commonly exhibit interior wall plaster [e.g., Aztec West (Morris 1928:120, 272–273, 289, 294], Bis sa'ani (Breternitz et al. 1982:187, Table 29], Casamero (Sigleo 1981:3), Guadalupe (Pippin 1987), Morris 39 (Morris 1939:52), and Salmon Ruin (Irwin-Williams et al. 1975:52, 120)]. Examples of exterior wall plaster are rare due to the vagaries of preservation, but it is known from buried or remodeled great-house walls at Chetro Ketl (Lekson 1984: 173) and Bis sa'ani (Breternitz et al. 1982: 185, 187). Ethnographic evidence also supports the practice of plastering exterior pueblo walls (Mindeleff 1989: 137–138). Mindeleff (1989:45) observes that Zuni walls are plastered but not banded and adds that "it is not to be expected that walls would be carefully constructed of banded stonework when they were to be subsequently covered with mud." The fact that canyon great houses do exhibit careful and aesthetically pleasing banded veneers suggests that banding had stylistic meaning for the builders. If exterior walls were plastered, the presence of banding might reasonably be assumed to indicate shared knowledge of a specific Chacoan construction style, whether or not it was imbued with additional symbolic value.

The presence/absence of banded veneers was tabulated for 38 outliers where masonry is exposed. Type 2 or Type 3 masonry was considered synonymous with banding. Data sources are sometimes ambiguous, describing facings as "coursed" or "Chaco-style." Pictures were consulted when available. In cases where ambiguity could not be resolved, the great house was excluded from the analysis. Where bands were intentionally created through the use of other raw materials besides sandstone, banding was counted as present. Banding is present at 20 and absent at 18 outlier great houses in the data set (Fig. 4; Table 2). However, no significant associations were found between banding and other internal variables (Table 3). Banding is not patterned in distribution, and the fact that banding was probably hidden behind plaster further suggests that the builders of structures exhibiting banding shared information and learning frameworks. A directed, Chacoan origin is suggested for the great houses where banding is present, but what of those where it is absent? Temporal distortion and inconsistencies in the data might account for the absence of banding in a few cases, but it seems likely that some of these great houses might be of local construction.

Symmetry

All canyon great houses exhibit symmetry, defined as correspondence in size, shape, and relative position of parts on opposite sides of a dividing line, center, or axis. In outlying great houses, symmetry may be expressed by two facing kivas within one rectangular roomblock, by two joined roomblocks, or by two separate roomblocks (Vivian 1990:298). Vivian (1970) contends that symmetry is an architectural manifestation of dual social organization that characterizes canyon great houses but not small-house sites. Dual social organization is expressed most strongly among the Eastern Pueblos such as the Tewa (Ortiz 1965, 1969). Ortiz (1965: 389) describes Tewa dual organization as "a system of antithetical institutions with the associated symbols, ideas, and meanings in terms of which social interaction takes place." Apparent asymmetries are balanced during an annual or biennial course of rotation in what Vivian (1990: 431–435), following Johnson (1982), refers to as a rotating sequential hierarchy. Bilateral architectural symmetry is seen as a direct indicator of the existence of dualism and possibly the presence of a rotating sequential hierarchy as a mechanism for organizing tasks, decision making, ritual, labor, or other aspects of society. Vivian (1990:299) further contends that symmetry and concomitant dual social divisions exhibit a patterned appearance expressed most strongly in the southern and eastern parts of the San Juan Basin.

If a great house is comprised of two equal, opposing parts, it is considered to possess symmetry. Symmetry may also be present in the guise of two equal, opposing roomblocks or discrete structures. The universal presence of symmetry at great houses would be considered support for a directed, Chacoan origin for the structures. A patterned distribution of great houses with symmetry might support Vivian's (1990) interpretation or might suggest other, variable relationships between outliers and the canyon. A complete lack of patterning in the distribution of symmetry may be considered as support for local great-house construction, especially in those cases where symmetry is absent.

Architectural information permitted the examination of seven Classic Bonito phase canyon great houses and 49 Classic Bonito phase outlier great houses for the presence of symmetry. Great houses were discarded from the data base if their plans were too ambiguous or too obscured by rubble to make an assessment. There may be some conflation of noncontemporaneous building episodes among the remaining sample, but this should not be detrimental to the analysis if symmetry during the Classic Bonito phase was accomplished to further symbolic ends. Symmetry is present at 25 and absent at 24 outlier great houses (Fig. 4; Table 2). No significant associations were found between symmetry and any other variable (Table 3). Like banding, symmetry is neither ubiquitous nor patterned in distribution. Diversity among these variables could be argued to support a local origin for some Bonito-style architecture, especially where symmetry is absent.

Elevated Kivas

As discussed above, most Chacoan great houses contain enclosed kivas. Some great houses also contain *elevated kivas,* or enclosed kivas are found at a second-story level or higher. In rare cases, a series of up to four enclosed kivas are vertically stacked on top of one another to create a *tower kiva* (Marshall et al. 1979:18). All Classic Bonito phase canyon great houses, with the exception of single-storied Pueblo Alto, contain elevated kivas. There are a number of possible reasons for the construction of elevated kivas. Vivian (personal communication, October 1997) proposes a functional explanation, contending that second-story kivas were built to maximize the space available within the confines of the great house. Other researchers have proffered the idea that tower kivas functioned as part of a signaling network (Hayes and Windes 1975). Signaling alone does not seem a sufficient explanation because, as Lekson (1984:52) states, "a similar height could have been attained without the Tower Kiva." Marshall et al. (1979:204) offer the following intriguing speculation credited to Fewkes.

> It must be remembered that the ceremonial room or kiva, in modern mythology, represents the underworld out of which . . . the early races of men emerged. The tower kiva at Kin Ya'a may have been four kivas, one above another, to represent the underworlds in which the ancestors of the human race live in succession before emerging into that in which we now dwell.

Tower kivas and second-story kivas are considered here together as elevated kivas to circumvent the confusion surrounding the two terms that are sometimes used interchangeably (e.g., Lekson 1984:52). This also avoids misinterpretations related to the difficulties inherent at many sites with reduced walls in deciding wall heights and numbers of stories, and it provides a sufficient sample size for comparison with other variables. A patterned distribution of elevated kivas might indicate information exchange among a subset of outlier great houses.

Tower kivas are documented at three outliers, including Kin Klizhin, Kin Ya'a, and Haystack (Marshall et al. 1979:15–16). Second-story kivas are documented for 11 outliers, bringing the total number of outliers with elevated kivas to 14. The presence/absence of elevated kivas was found to be significantly associated with area (Table 3). Elevated kivas are more common at larger sites. A total of 60 cases where both elevated kiva presence/absence and great house area are available were ranked by great house area (see Table 2). Great house two-dimensional roofed area ranges from 72 to 4415 m^2 with a median of 427 m^2. A total of 69% of the elevated kivas occur in the upper half of the great-house sample (area >427 m^2). A total of 46% of the elevated kivas occur in the upper quarter (area >818 m^2).

Although no statistically significant association was found between elevated kivas and location, all except two elevated kivas (Salmon and Morris 41) are found in the south (Fig. 4). Elevated kivas also are significantly associated with road segments. A Pearson's chi-square test found that elevated great kivas and road segments are not independent at a probability level of 0.046, although the association between the two variables is weak ($\phi = 0.264$). The implications of these results for directed vs local construction at outliers are ambiguous at best—although some patterning is present, there are no significant associations between elevated kivas and other internal variables.

Kiva:Room Ratio

Kiva:room ratio represents the number of kivas (excluding great kivas) against the total number of rooms within the structure. For example, a site with 5 kivas and 25 rooms would have a kiva:room ratio of 5:25, or 0.20. Although no direct assignment of function can be made to rectangular or round rooms without excavation data, kiva:room ratio uses some basic assumptions about the nature of these rooms to provide a way to get at possible differences in overall great-house function. At Pueblo II Anasazi sites, rectangular rooms are commonly found to have been used for habitation and/or storage. Round rooms, or kivas, are commonly considered to have been used for ritual purposes at least some of the time (Adler 1989; Lekson 1988). Although there is a wide range of variability, small-house or habitation sites frequently consist of three to six rooms associated with a single kiva. Because these small sites often are equated with single households, the logical conclusions are (1) that each kiva was used by a small group of related people and (2) that any ritual activities conducted in the kiva were organized on the basis of kinship. Steward (1937) noted a kiva:room ratio of 1:6 to 1:5 to be characteristic of Pueblo II Anasazi habitation sites and reflected that this indicated every lineage constructed its own kiva and conducted its own ceremonies. A later decrease in the number of kivas per room, with kiva:room ratios of 1:15 to 1:25, was interpreted by Steward as reflecting a change in the organization of ritual. At this point, kivas were considered to move beyond their role as structures for familial ritual and to acquire a new function as settings for integrative social activities (Lipe and Hegmon 1989).

Powers et al. (1983:Table 41) lists kiva:room ratios for a number of great houses and small sites. Classic Bonito-phase canyon great houses ($n = 7$) have a median kiva:room ratio of 1:26.3. Canyon small sites ($n = 9$), in contrast, have a median kiva:room ratio of 1:6.1. A Mann–Whitney *U* test found the two sets of data to be significantly different ($p = 0.001$), suggesting differences in social organization and kiva function between the two types of structures (Van Dyke 1998:253–254). A comparison of canyon and outlier great-house kiva:room ratios should help determine whether canyon and outlier great houses are likely to have served similar functions without actually having to address the issue of what those functions were. That is, if both canyon and outlier great houses were used for the same thing, whether it be habitation, storage, or ritual activities; if kivas served similar functions at canyon and outlier great houses; and if canyon and outlier social structure were similarly organized, then kiva:room ratios of both outlier and canyon great houses should be similar, regardless of other differences in overall size. Variability among the set of outlier great house kiva:room ratios would support local or diverse origins for outlier great houses.

Kiva:room ratios were calculated for 57 Classic Bonito phase outlier great houses. This measure included second-story room counts. The dependent metric variable kiva:room ratio was compared against the other variables in the analysis using nonparametric tests. Kiva:room ratios were found to be significantly different in the north and south (Table 3). This result reflects the fact that great houses located in the south ($n = 46$) have a median kiva:room ratio of 1:9, whereas great houses located in the north ($n = 11$) have a median kiva:room ratio of 1:20.

The 1:20 kiva:room ratio figure for northern great houses is similar to that obtained by Lipe (1989:56, Table 1), who estimates a kiva:room ratio of 1:15.2 for nine Chacoan great houses in the Mesa Verde area, although contemporaneous, local "Mesa Verde Anasazi" pueblos exhibit kiva:room ratios of 1:6.5. This pattern suggests Chacoan great house kivas functioned at a large-scale, integrative level, whereas kivas in local pueblos were more likely used by households or extended families (Lipe 1989:59, 64). In the current study, significant differences in kiva:room ratios between northern and southern outliers may reflect differences in social organization, kiva function, and/or relationship with Chaco Canyon. Classic Bonito phase great houses may have had more of an integrative community function in the north than in the south. As with elevated kivas, the results of the analysis with respect to the directed-*vs*-local question are ambiguous.

Summary of Results

Results of the comparative analysis indicate the Chacoan outliers found across the San Juan Basin and in adjacent areas should not be viewed as one homogenous entity. Rather, a variety of relationships appear to have existed between canyon and outlier great houses. Some outlier great houses bear close resemblance to canyon great houses and probably were built under canyon influence or direction, but others may be local. Regionally patterned distributions may indicate the existence of diverse, regionally discrete relationships between outliers and the canyon. Findings for each of the five variables are summarized in Table 4. Core-and-veneer masonry is nearly ubiquitous in distribution, indicating that this construction technique was widely shared. Banding and symmetry occurred in approximately half the cases, but they did not co-occur in a patterned relationship, and no discernible patterning was found in the locational distribution of these variables or in their association with other variables. A local origin could be argued for outlier great houses where the variables are absent. Kiva:room ratio and elevated kivas are not ubiquitous but do exhibit some regional patterning. Where regional patterning exists, it suggests that some outlier groups shared information with each other and with Chaco, but other groups did not.

Kiva:room ratios in the north (Region 1) are significantly lower (i.e., fewer kivas per room or more rooms per kiva) than those in the south (Regions 2 and 3), suggesting differences in social organization, great-house function, and/or relationships with Chaco Canyon between the two areas. Northern median kiva:room ratios are nearer the canyon median than southern kiva:room ratios, which might imply a closer relationship between the canyon and the northern great houses. However, most other evidence links the canyon with the south. Architectural attributes more likely in the south include roads and earthworks, larger great houses, elevated kivas, and higher kiva/room ratios (i.e., more kivas per room or fewer rooms per kiva). This area includes the Chuskan slope, the central basin, the south Chaco slope, the Red Mesa valley, and points farther south and west. Such subregional divisions were not implemented for the current analysis because the subsequent sample sizes for each subregion were too small to elicit meaningful results. However, these topographically defined subregions bear further investigation as discrete or semidiscrete interactive entities.

The central basin (Region 2) does not exhibit discrete patterning with respect to the internal architectural variables. However, the central basin contains most of the small outlier great houses, and absence of great kivas is more likely. Because the central basin is the area closest to Chaco, the people living there undoubtedly would have had more intensive interactions with Chaco than people living in more distant areas of the San Juan Basin and might have used canyon ritual facilities rather than constructed their own. This pattern resonates with Breter-

TABLE 4
Summary of Findings for Analysis of Internal Variables

Internal variable	Statistically significant associations	Meaningful findings	Ubiquitous distrib.?	Patterned distrib.?	Directed or local construction?
Core-and-veneer	Distance	More likely to be absent when distance from Pueblo Bonito is great	Yes	Yes	Directed
Banding	None	Equally likely to be present or absent in any region, sometimes created by alternative means	No	No	Local
Symmetry	None	Equally likely to be present or absent in any region	No	No	Local
Elevated kiva	Area	More likely at large great houses	No	Yes	Ambiguous
Kiva:room ratio	North/south	Higher kiva:room ratio (fewer rooms per kiva) in the south	No	Yes	Ambiguous

nitz et al.'s (1982; Doyel et al. 1984) idea of a Chaco Halo, where sites located in the immediate environs of Chaco Canyon are considered economically and demographically synonymous with sites in the canyon.

THE COMPARATIVE STUDY IN PERSPECTIVE

The results of the analysis suggest architectural information followed subregional networks of interaction across the Chacoan world, but the specific nature of these networks is not defined by the current study. Bonito-style architecture was not spread in a homogenous manner, and the presence of Bonito-style architecture does not necessarily entail direct contact with Chaco Canyon. Large-scale architectural similarities need not be interpreted to indicate participation in one coherent, centralized Chacoan system. Some outlier communities may be local, in situ developments. A similar interpretation was reached by Marshall et al. (1979:337) and Powers et al. (1983:341).

To further explore the continuum of relationships between outlier communities and Chaco Canyon, an index of Chacoan similarity was devised using distance from Chaco Canyon and the five internal variables. Table 5 represents an attempt to quantitatively arrange 36 outlier great houses along a continuum between local and directed Chacoan extremes. Great houses from Table 2 were included only when all relevant information was available. Index scores can range between 0 and 5, with 0 representing an outlier great house differing in the extreme from canyon great houses and 5 representing an outlier great house completely at home in Chaco Canyon. One point was assigned for presence of each of the 4 categorical variables. One point was assigned when kiva:room ratios fell within 1.24 standard deviations of the mean canyon great house kiva:room ratio of 0.046. Finally, logged distances from Chaco (ranging between 1.06 and 2.28 based on logged values of distances listed in Table 2) were subtracted from the maximum subtotal of

5 points so that those outliers nearest the canyon received the least "distance demerits" and vice versa. Outlier great houses categorized in this manner earned scores ranging from −1.28 (Bluff) to 3.30 (Kin Ya'a). Great houses with low scores can be considered more local, and those with high scores can be considered more Chacoan. Of course, these rankings could vary considerably if one or more variables were given more weight or if other variables were incorporated into the index. Table 5 is not meant as the last word on the directed *vs*-local question, but it does provide one way to illustrate the range of variability present among outliers. Many of the sites toward the Chacoan end of the spectrum are qualitatively different from the rest of the outlier pack. Outlier sociopolitical dynamics in communities far removed from the canyon environs might have been quite different from sociopolitical organization near to or inside the canyon. Further investigation into communities or subregions near the local end of the scale should incorporate other lines of evidence for or against local, in situ development (Van Dyke in press).

TABLE 5

Outliers (n = 30) Ranked from Most (High Scores) to Least (Low Scores) Interaction with Chaco Canyon Based on Internal Architectural Attributes and Distance

Outlier	Index score
Kin Ya'a	3.30
Peach Springs	3.25
Salmon	3.14
Kin Klizhin	2.94
Village of the Great Kivas	2.92
Pierre's	2.92
Ida Jean	2.83
Kin Bineola	2.78
Lowry	2.72
Pueblo Pintado	2.29
Kin Nizhoni	2.09
Morris 39	2.04
Guadalupe	2.02
Toh La Kai	2.00
Morris 41	1.98
Navajo Springs	1.72
Bee Burrow	1.51
Escalon	1.46
Muddy Water	1.33
Whirlwind	1.31
Grey Hill Spring	1.29
Andrews	1.12
San Mateo	1.08
Wallace	0.79
Greenlee	0.77
Casamero	0.14
Escalante	−0.25
Fort Wingate	−0.98
Squaw Springs	−1.04
Bluff	−1.28

Implications for Chacoan Models

Results of the analysis indicate that substantial subregional diversity is contained under the rubric of what is commonly held to constitute the Chacoan "system." The fact that Bonito-style architectural characteristics (great houses, great kivas, and surrounding communities) are found over a wide area should not be held to indicate that all those communities were integrated into a holistic Chacoan system, nor does it necessarily follow that they were all in communication with one another or with Chaco Canyon. Although some outliers may have interacted intensively with Chaco Canyon, others may have interacted rarely with the canyon or not at all. Thus, it is likely that more than one model is needed to explain the appearance of Bonito-style architecture in Chaco Canyon as well as throughout the San Juan Basin and adjacent regions. Different explanatory theories may be appropriate for different subsets of outliers. The models of Vivian (1989, 1990), Wilcox (1993), Toll (1984, 1985), and the Chaco Center archaeologists (Judge 1979, 1989; Judge et al. 1981; Schelberg 1984) that posit direct canyon involvement with outlier great-house construction may be appropriate for outliers near the upper end of the "Chacoan similarity" index. These outliers presumably derived Bonito-style architecture by virtue of direct interaction with Chaco Canyon. But how was Bonito-style architectural information transmitted among outlier communities at the lower end of the index? No statistically significant relationships were identified between internal variables and distance from Chaco Canyon, so it does not appear that architectural information moved in a "down-the-line" manner from the canyon. This does not support a scenario in which neighboring communities cooperated to construct Bonito-style architecture, nor does it suggest that shared labor is responsible for the spread of Bonito-style architectural forms.

Peer–polity interaction could account for the appearance of Bonito-style architecture over a wide area without necessitating shared labor or direct participation in events at Chaco Canyon. In a peer–polity situation, Bonito-style architecture would have spread through observation and competition between neighboring communities. Construction of Bonito-style architecture would have benefited local leaders seeking to bolster personal prestige through competition on a regional scale. Great houses are impressive features; once they appeared in one community, leaders of a neighboring community might have had little trouble convincing their populace that competitive emulation was necessary. Everyone in the community would have contributed their labor or other resources, but the economically advantaged members of the community would have been able to contribute more. This would have specifically enhanced the status of those with economic resources to spare, despite an overarching rubric of a shared, egalitarian, communitywide endeavor. In this manner, individual or factional power would be reflexively constructed as well as expressed.

Peer–polity interaction elaborates on the sorts of local aggrandizing strategies loosely suggested for the outliers by the work of Mathien (1993) and Sebastian (1992). It is also consonant with the ritual landscape idea proposed by Stein and Lekson (1992). If, as Stein and Lekson suggest, Bonito-style architecture was constructed to function as a ritual setting, social inequalities could have been expressed, legitimated, and created through construction and through ceremonies or activities enacted in the facilities. Control of ritual knowledge goes hand-in-hand with the legitimation and construction of political, economic, and social forms of power (Bradley 1984; Hayden 1995; Whiteley 1986). It is likely that the individuals or factions who organized construction of the architecture played highly visible roles in any ceremonial activities that took place there. Because the production of both big buildings and ritual is expensive, it is likely that these leaders had an economic power base of sorts from which to work. In a scenario similar to that proposed by Sebastian (1992) for Chaco Canyon, leaders might have been descendants of the first settlers in the area who, by virtue of being firstcomers, farmed the most productive land and therefore produced and controlled access to most community surplus. Construction of dramatic, public ritual space could have validated these factions' exclusive access to ritual knowledge and increased their prestige or social power.

CONCLUSIONS

The presence of common architectural elements across the San Juan Basin and adjacent areas need not be interpreted to indicate that the entire area participated in one coherent, centralized Chacoan system. The analysis results suggest that a perspective in which all Chacoan outliers are integrated into one Chacoan system may well obfuscate more than explain. The picture that emerges from the analysis is of a set of outliers characterized by diversity rather than homogeneity, requiring a range of interpretations. Like many outlier studies, this work has focused on Bonito-style architectural elements at the expense of the surrounding communities. Outlier great houses and associated features are generally well described, but information for the surrounding communities often tends to be sketchy. This reflects the daunting nature of the investigative task—several of the 58 outliers used in the present study are known to be surrounded by upward of 50 small sites. Although the picture is slowly improving (Harper et al. 1988; Kantner and Mahoney in press; Kendrick and Judge 1996; Marshall 1994a, 1994b; Reed et al.; Van Dyke 1999), advances in our understanding of outlier dynamics are predicated upon the kinds of information that only community studies can provide.

Massive, visually impressive architectural features such as Chacoan great houses obviously contained symbolic meanings for prehistoric builders and viewers. In trying to explain why large-scale architecture appeared contemporaneously over a wide area, as in the Chacoan case, one important part of the puzzle involves determining the social mechanisms through which the architectural information was transmitted. Carr (1995b) discusses the communicative potential of highly visible architecture, but this does not preclude the structures from also containing enculturative information in the form of low-visibility, internal attributes that could not have been easily emulated by outsiders and that reflect how people shared information as they built the structures. Patterning among low-visibility, internal attributes should help identify shared learning frameworks and concomitant social affinities even within the context of high-visibility architecture.

Of course, given the tremendous complexity of social and material culture, patterns often fail to appear as requested. One drawback to this type of analysis is that when patterning is ambiguous or absent, myriad explanations could account for the ambiguous results. In this study, I have argued that ambiguity indicates outlier relationships are more complex than initially assumed and hence are only rudimentarily identifiable here. Incomplete, missing, or erroneous data also may have muddied the waters, but those sorts of problems can be ameliorated through continued outlier community investigations. Assumptions about the connections between social relationships and architecture are not altogether satisfactory but could be refined through continued ethnographic research.

If the construction of archaeological knowledge merely entailed acquiring enough of the right data and identifying the proper linkages between material culture and human activity, our course would be laborious but direct. However, despite the assumptions of this study, architectural patterning does not passively reflect social organization. Relationships between society and the built environment are interactive rather than reflective. Social forms are constituted, legitimated, and changed by the ongoing, recursive interaction between spatial perception, representation, and experience (Lefebvre 1991). A categorical approach can but represent a simplistic and incomplete attempt to construct information through pattern identification. To understand the uses and meanings of prehistoric buildings within their social contexts, creative methods must be devised to examine the ways in which people interact with spatial forms. Despite the limitations of material culture, investigations into such issues as labor organization, communication of building techniques, uses of spaces, intracommunity social dynamics, or representations of space in nonarchitectural media are within our grasp and should assist in this regard. The ultimate goal should be to interpret the meanings architectural forms held for those who built, used, and perceived them in prehistory.

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