Photographic Analysis

A Study of Architectural Change at Oraibi Pueblo

CATHERINE M. CAMERON

The multi-storied pueblos of the Southwest appear ancient, timeless, and unchanging. Most of these villages have been occupied for over 400 years, and they reflect a traditional Native American life-style that contrasts dramatically with the rapidly changing modern world. Archaeologists who study prehistoric Pueblo peoples look to the living Pueblo villages for ways of interpreting the past. Architecture is probably the most important source of information archaeologists use in their interpretations, and modern pueblos, with their use of traditional construction materials and methods, seem like the perfect analogues for prehistoric pueblo buildings.

But the apparent timelessness of pueblo structures may be deceptive. Archaeologists are becoming increasingly aware that Pueblo buildings, both ancient and modern, undergo almost constant change as structures are modified, razed, and rebuilt to suit the needs of their occupants. The processes that cause architectural change at pueblos

Figure 1. The Snake Dance Plaza. This photo was taken in the late 1890s by Ben Wittick. Five of Oraibi's 13 kivas are located in this plaza, although only 4 are visible in the photo. Note the number of first story rooms that now have doors. This was part of a change in architectural style brought by Euro-Americans. Most of the buildings to the left were constructed during the 1890s. One was still under construction when the photo was taken. In Figure 13 it can be seen completed.

Photo courtesy of the School of American Research Collections at the Museum of New Mexico, Santa Fe, ms. 16410
must be thoroughly understood before archaeologists can hope to use prehis-
toric buildings to interpret the past.

I found that architectural change at prehistoric pueblos can be studied by
observing structures at a historic pueblo over time. For my study, I used historic
photographs and a method that archaeologists Richard Abston has called "Re-
versal repeat photography." Repeat photography is a technique used by ge-
ographers, geologists, and botanists to document changes to the landscape.
The process involves taking sequential views of the same scene at controlled
intervals using precisely the same camera position for each view (Abston 1990).

Historic photographs of pueblo buildings were never produced using the
ordinary methods required for repeat photography. However, innumerable
"casual" photographs taken of pueblos during the past century overlap
so much that the methods of repeat photography can be approximated. Especially
useful is the fact that at many pueblos, a particular camera position captured
the largest number of buildings, and almost every photographer who visited
felt obliged to duplicate this shot.

I selected the Hopi Pueblo of Oraibi for my study. Oraibi is located in north-
eastern Arizona on Third Mesa, the westernmost of the three Hopi Mesas (Fig. 3). It is one of the oldest continu-
ously occupied settlements in the United States, possibly founded as early as
the 12th century A.D. Houses were built of sandstone masonry, with roofs of wood beams, brush, and earth.
In the late 1800s, when the first photographs were taken, homes were usu-
ally one room wide, but often three or even four stories tall (Fig. 2). They
were built in long, linear rooms, with adjacent homes sharing walls.
There were 25 rooms separated by "streets" or plazas, and most faced
southwest.

Oraibi was chosen because it would provide data on several types of archi-
technical change. First, it would exhibit the normal architectural change that oc-
curs as a result of both the developmental cycle of families and of the structural
limitations of building materials and techniques. Second, it would show the
effect on structures of large fluctuations in population. After a serious dispute at
Oraibi in 1906, the village split. Almost half the population of the village was
forced out (this group was called the "Hostiles") and moved away to found
tw new villages. Photos could show what happened to the structures these
unwilling emigrants left behind. Fur-

Figure 3. The Hopi villages lie
about 50 miles northeast of
Flagstaff in northeastern Arizona.
Oraibi is located on Third Mesa, the
westernmost of the three Hopi
Mesas. Oraibi, sometimes called
"New Oraibi," is located just below
Third Mesa. The two other villages
on Third Mesa, Hotevilla and
Pampa, were established by the
Hostiles who left Oraibi during the
1906 split.

Figure 4. Victor Mindeleff
mapped Oraibi in 1887. He and his
brother Constant had been hired by the Bureau of
American Ethnology of the Smithsonian Institution
to produce detailed maps of
Southwestern Pueblos so that
scale models could be pro-
duced for exhibitions. Their
original field maps were very
detailed, showing the loca-
tion of doors, windows, ladd-
ers, hatch openings, and
stairs. Figure 4 was re-
drafted from the published
version of the map and incor-
porates data from unpub-
lished field maps (Mindeleff
1887).
virtually no information on when or where they were taken. Eventually, I turned up photographs taken from every corner of the village. If a photograph seemed particularly useful, I asked for a xerox copy. I developed a catalog system that included all available information about the photograph, the institution at which it was located, and the number used by the institution to identify it.

At the end of the collecting trips, I cataloged over 800 photographs, and I began to order prints to be used in the analysis. The most useful views were oblique shots that showed long rows of houses in enough detail that modification to individual structures could be observed. Overlapping views taken at the same time were especially revealing because they provided a panorama effect while retaining a great deal of detail. Many views were repetitions or did not show architecture detail; these were dropped. In the end, I had assembled more than 300 prints of buildings at Oraibi dating between 1871 and 1948.

Figure 5. This small unseasoned plaza in front of Roomblock 9 combined two kivas. The two rooms indicated by arrows are parts of houses belonging to different families. In Figure 6, Roomblock 9 has been extensively rebuilt and these two rooms have been combined into one large room. Behind Roomblock 9 is Roomblock 10, with a single whitewashed, fourth story room. Oraibi had only a few fourth story rooms at the turn of the century. The photo was taken in 1909 by A.C. Veasey.

Figure 6. This view of Roomblock 9 was taken by Wesley Bradford in 1918. The first story rooms have been extensively rebuilt and many of the upper story rooms dismantled. The room indicated by the arrow was built by combining two adjacent rooms which had once been owned by different families (see Fig. 5). One of the houses may have been abandoned and the rooms appropriated and rebuilt by the remaining family. Note the roomblocks to the left of the photo which have been extensively dismantled since the split.

Two additional sources of data were of great assistance. In 1987, Victor Mindeleff, an employee of the Smithsonian Institution's Bureau of American Ethnology, produced an enormously detailed map of Oraibi as part of a study of Southwestern Pueblo architecture. All structures were shown, multiple stories were indicated, even the location of doors, windows, and ladders were placed correctly on the map (see Fig. 7). The map provided a perfect baseline from which to begin.

Figure 7. View of Roomblock 12 taken in 1901 by Charles Carpenter. This bent ladder pole protruding from the kiva made this roomblock easy to identify. A large stack of firewood is piled in front of one house, and strings of corn or cotton hang from the walls of another. Figure 8 shows Roomblock 12 after the split, when many of these houses are abandoned.
“Seeing” Historic Oraibi in Photographs

The most time-consuming, although entertaining, part of the project was working with the photographs. Three hundred photographs had to be fitted together and then ordered chronologically. The first task was to link the photographs with Minderleff’s map. I started by matching photos showing similarities in the buildings, and grouping those that showed the same set of buildings. Minderleff’s map was invaluable for clues to the location of buildings in the photos. The positioning of kivas was the most helpful key. Kivas are semi-subterranean religious structures that are located in plazas or in the “streets” between buildings. In the late 19th century, Oraibi had 13 named kivas, all of which had been photographed at some time or another.

The process of identifying the photographs was painstaking and involved much comparison back and forth. Several views were easy to identify, and I began with them. The “main plaza” was the subject of innumerable photographs and was readily identifiable. In some cases, two or three were obviously the same area of the site, but could not be located on Minderleff’s map. Only after careful examination of structures in the background and at the edges of the photos could the buildings be identified.

Once major areas of the site were identified, the photographs were put in order. Each area of the site was shown, in at least a few dated photos so that it could be possible to create a temporal sequence. Undated photos could be placed in approximate sequence by reference to the dated architectural changes observed.

Oraibi’s Photographers

The Southern transcontinental railroad was completed in 1882 and ran just 40 miles south of the Hopi Mesas. Hopi was soon inundated with Euro-American explorers, missionaries, tourists, teachers, anthropologists, and passers-by. Many brought cameras and films and their images were used in this architectural study. Unfortunately, most visitors to Oraibi were unobsessed with native religious ceremonies. Eventually, photographers became so disruptive at Hopi ceremonies, fighting each other for the best view, that a ban on all photography in the villages was established. As a result, fewer photographs of Oraibi were taken in the 20th century than in the 19th. In response to the wishes of the Hopi, historic photographs of religious ceremonies are not longer published and were avoided during this study.

Probable the first photographer to capture scenes at Oraibi was John Hillers (Figs. 2, 9). He was a German immigrant who signed on as a boatman with John Wesley Powell’s expedition expeditions through the Southwest. Hillers became fascinated with the work of E.O. Beaman, Powell’s expedition photographer, and eventually traded his boatman’s duties for those of an assistant photographer (Fleming and Luksky 1986:109). Beaman was discharged after a dispute with Powell, and Hillers became Powell’s official photographer for other Southeastern expeditions during the 1870s. He later became a photographer for the Bureau of American Ethnology. Hillers photographed Oraibi numerous times between 1871 and 1881, documenting the village at a time when it had experienced only sporadic contact with Euro-American culture (Fowler 1989).

An extensive collection of photographs was made by H.R. Volh, a Menominee missionary who lived with his family near Oraibi between 1893 and 1902 (Fig. 12). He not only pursued the religious conversion of residents of Oraibi, but also worked as an ethnologist, often in connection with the Field Museum of Natural History in Chicago. He was aggressive in both activities, often intruding into the sanctity of the kivas (Whiteside 1986:83-86). He was disliked by many Hopi, and created a long-lasting distrust of ethnographic work at Oraibi.

Several professional photographers captured views of Oraibi at the turn of the century. Adam Clark Vroman, a prosperous California bookstore owner, made several trips to the Southwest between 1895 and 1904 and took numerous photographs at Oraibi (Fig. 5). Perhaps the most comprehensive collection of Oraibi photographs was taken by Charles Carpenter in 1901 (Figs. 7, 10, 13, 14). Carpenter was the photographer for the McCormick Expedition of the Field Museum of Natural History. He apparently spent an entire day photographing Oraibi from almost every angle. His glass negatives produce clear, sharp prints, in which every detail can be discerned. Because of Carpenter’s photographs, the architecture of Oraibi in 1901 is better known than in any other year in its history.

The 1906 flood at Oraibi produced tensions in the village and it is likely that visitors were not welcome after this event. Plans on photography in the Hopi villages began to be established in 1913 (Lyon 1988). Photographs of Oraibi taken after 1906 are almost exclusively non-ceremonial; photographs taken after the mid-1930s are virtually unavailable. Although architectural change at Oraibi continues to the present day, photographic records of this change are rare.
Dismantled rooms were much easier to identify. Rooms visible in the earliest pre-1957 photos but not shown on Mündel’s later map were presumably dismantled. Likewise, some rooms appear on Mündel’s map or in early photos, but not in later photos of the same area. Some photos showed wall stubs of dismantled structures still in place (Figs. 11, 12).

Rebuilt rooms were identified by major architectural alterations, such as a change in the size of the room or the location of the walls. Two separate rooms might be combined into one during rebuilding, resulting in a much larger room. Intriguingly, combined rooms were much more common after the 1966 split (Figs. 5 and 6). Rooms were rebuilt for many reasons, because they had become structurally unsound or were too small to accommodate the family occupying the structure; to better fit the family’s needs; to incorporate European architectural styles; or to incorporate Spanish Revival elements.

Change in room function was identified primarily by the addition (or occasionally blocking) of doors. Newly built rooms first appeared in later photos (Fig. 13). New rooms suggested the expansion of existing households or the creation of new households as part of family developmental cycles. Even in a static population, some households will increase in size, and will either expand space in existing structures or split, with part of the group building elsewhere. New structures may also indicate that the total population of the settlement is growing, either through immigration or internal population expansion.

**Periods of Change**

Now that the major types of architectural change at Orabi had been identified, I could begin to work on the real goal of the project: understanding change through time. The architectural data could be separated into three distinct periods. Period 1, from the earliest photos, provides the earliest glimpse of the site, when Orabi was least affected by European contact. Period 2 (1857 to 1900) encompasses architectural change before the split, and is the period when European influence is first apparent. Period 3 (1900 to 1945) shows the dramatic effects of the split at Orabi.

Photographs were rare during the first period, and fewer than 50 rooms were documented. Most architectural change at this time was probably the result of changes in the housing needs of individual families. Of the rooms visible in photos, only 7 showed architectural change: 1 room was dismantled, 2 were rebuilt, and 6 were newly built. All of the newly built rooms were additions to existing homes, presumably expanding space for growing families. One of the rebuilt rooms was located behind the dismantled room on the third story and may have required extensive remodeling once the dismantled room was removed. The rebuilt room probably changed function from a dark interior storage or sleeping room to a front-facing habitation room.

Period 2, in the late 19th century, saw a significant and surprising increase in the rate of architectural change at Orabi. At least 55 new rooms were built; some of these rooms were part of at least 10 new houses. Few dismantled rooms were seen in photographs. Rooms that were no longer used were quickly dismantled and the building materials reused. Photos often showed piles of masonry and stacks of roof beams stockpiled ready for reuse (Fig. 14). Population was increasing rapidly. Historic documents suggest that the cause was both immigration from other Hopi villages and an increased birth rate (Levy 1992).

Bedrooms at Orabi were also

**Architectural Change at Orabi**

Rooms at Orabi underwent four major types of architectural change: they were abandoned, dismantled, rebuilt, and newly constructed. A variety of different visual clues identified each type of architectural change. Some abandoned rooms were easy to identify: their walls were cracked and deteriorating and roofs were missing. Others were intact, but had clear indications that they were no longer in use (Figs. 3, 10). In a few cases, a blocked door suggested that a room was abandoned, although these were sometimes found in rooms used to store ritual paraphernalia.

Figure 11: Room block 4, photographed in 1928 by A. E. Douglass of the Laboratory of Tree-Ring Research. This is an almost identical view to that taken by Yoth in the late 1850s (Fig. 12). Note new first-story doors and windows. Room 418 has been completely dismantled, although fragments of the room remain. The two rooms below it look dismantled and unused. The doorway may have been removed from the second-story room, and the first-story room has what appears to be a blocked doorway. The whole house has been abandoned.

Figure 12 (right). This close-up of Room Block 4 was taken in the late 1950s by Reverend H.R. Yoth. Many of these rooms look much as they did in Miller’s 1870 photo (Fig. 2). Room 418 is indicated by the arrow. In Figure 11, Room 418 has been dismantled.

Photographs courtesy of Special Collections, University of Arizona Library, Tucson.
modifying their traditional architectural style. The effects of European architectural methods and materials were first apparent at Orbili after about 1890. Many of the abandoned and damaged rooms were in upper story rooms during this period. The traditional multi-storied style of pueblo houses had partly been defensive. Since other groups, such as the Navajos, often raided Hopi pueblos, the Hopi lived in upper story rooms which could be easily defended and used the lower story rooms primarily for storage. Upper story rooms were reached by ladders that could be pulled up in times of attack.

The late 19th century, rains were no longer a problem and it was safe to have habitations in lower stories. Doweels and windows began to appear in ground-floor rooms as they were converted from storage rooms to living rooms. At the same time, Euro-American construction methods and materials began to change Hopi architectural styles. Mill-bombed and glass windows were introduced. Wagon and draft animals, almost unknown at Hopi before the late 19th century, allowed residents to procure larger roof beams and build larger rooms.

Increased room size also reflected the introduction of wood-burning stoves that made it easier to heat larger interior spaces. As late as the 18th and 17th centuries, Hopi hearths had no chimneys, and heating a room meant having been a very smoky process. Even with chimneys, Spanish-style fireplaces located along walls threw out little heat. In the late 19th century, photos show the rapid replacement of the old exterior chimney (usually a stack of pots with their bottoms broken out) with metal stove pipes (Fig. 10).

The 1900 split had a dramatic effect on the previous architectural growth at Orbili. When half the population departed, many houses were abandoned and entire rooms fell into ruin (Fig. 11). Photos show that the abandoned houses were slowly dismantled. Apparently members of the "Hostile" group returned to scavenge building materials for their new villages. During the early decades of this century, some people who had stayed at Orbili began to move to the new villages of Kykotsmovi, located just below Third Mesa. Here, Christian churches and schools were available to those who had been persuaded to take on Euro-American ways. Some abandoned rooms at Orbili were probably dismantled to build new structures at Kykotsmovi.

The distribution of abandoned rooms at Orbili after the split stemmed from a very interesting pattern. Most of the abandoned structures were located at the east end of the village, and people at Orbili still say that this was "where the Hostiles lived." But Titts' census shows that Hostile families had been distributed throughout the village. Apparently, after the split, families relocated to houses in the west part of the village, especially near the Main Plaza where important ceremonies were performed. Houses in this area of the village that had once belonged to Hostils were reoccupied by people who chose to remain in the village. The split had caused major changes in the internal settlement pattern at Orbili.

Archaeological Lessons

Historic photographs proved to be a remarkably useful tool for observing long-term architectural evolution of a pueblo. I was able to observe the construction and modification of Orbili over a period of almost 50 years. During those years, architectural change was almost constant. New buildings were built and old buildings were rebuilt or removed. Patterns in the construction, remodeling, or removal of buildings contributed to houses in the west part of the village, especially near the Main Plaza where important ceremonies took place.