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# Archaeology Southwest

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### Rewriting Prehistory in the Hohokam Heartland

Douglas B. Craig, Northland Research, Inc.

HE GREAT HOUSE at Casa Grande Ruins National Monument is probably the most famous cultural landmark in southern Arizona, but it is only part of the story of prehistoric Casa Grande. The ancient town of Casa Grande had been thriving for 800 years by the time the Great House was built. For most of this time, the heart of the settlement was about a mile east of the Great House at a location called the Grewe site. It is estimated that Grewe and Casa Grande covered a combined area of about two square



The Great House (roofed) and Compound A in Casa Grande Ruins National Monument. Photograph courtesy of Adriel Heisey.

miles, with roughly half preserved today inside the national monument. The remainder, including nearly all of Grewe, lies buried beneath nearby agricultural fields.

Between 1995 and 1997, large-scale excavations were carried out by Northland Research, Inc. in portions of the Grewe-Casa Grande settlement as part of the Grewe Archaeological Research Project (GARP). Funding for the research came from the Arizona Department of Transportation (ADOT), which was planning to widen a railroad overpass along the highway between Coolidge and Florence, slicing through the middle of Grewe and skirting the edge of Casa Grande. The excavations focused on a large residential district at Grewe where hundreds of houses were excavated. The sample from Casa Grande was much smaller and more limited in scope. It included a few dozen houses and other features from a previously undocumented residential district on the outskirts of the settlement, as well as segments of several canals that formed part of the Grewe-Casa Grande canal system. With most of our project research completed, many of the secrets of the ancient community can be revealed.

The portion of Grewe investigated by Northland was occupied from about A.D. 500 to 1100. From the beginning, Grewe was a farming community, relying on irrigation agriculture for cultivating crops such as corn, squash, beans, and cotton. The earliest canals were probably located immediately north of the settlement along the edge of the Gila River floodplain.

One of the major surprises of the project was the discovery of almost two dozen widely dispersed early Pioneer period houses dating to the poorly known period from A.D. 500 to 650

#### This Issue

For nearly seven decades, our perceptions of the heartland of the Hohokam, the Middle Gila area south of metropolitan Phoenix, have been dominated by the results of Emil Haury's meticulously reported excavations at Snaketown. While many other research efforts in the region have modified and added to Haury's perspectives, it was not until the massive excavations at the Grewe site, reviewed in this newsletter, that a serious new factbased look at Hohokam prehistory along the Gila was possible. The results are fascinating and we are pleased to present a sneak preview from the researchers who worked on the project. Also in this issue is a look back at the spectacular finds of an earlier expedition and an encouraging update on preservation efforts for the portions of the prehistoric sites not in the Casa Grande monument. I learned a great deal as editor of this issue-I hope you enjoy it as much as I did!

> –Henry D. Wallace, Issue Editor

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Bird's-eye view of the GARP excavations in the heart of the Grewe site. The arc of overlapping house foundations at upper right represents one extraordinarily long-lived household. The communal cooking area is in the lower right portion of the photo.

at Grewe. Prior to these investigations, the only site in the Middle Gila River Valley with a well-documented early Pioneer component was Snaketown, 25 miles to the west. The evidence suggests that Grewe, like Snaketown, was a fairly large village from the outset.

The village grew and prospered, and we estimate that 400 to 500 people lived at Grewe on a permanent or semipermanent basis by A.D. 700. This figure assumes that the Northland sample comprised about 10 percent of the houses at the site, and that each house was occupied, on average, for 25 years. If these assumptions are valid, early Hohokam villages were much larger than previously thought. Our population estimates for Grewe are four to five times higher than recent estimates for the late Pioneer component at Snaketown.

A major downturn in the Grewe economy appears to have taken place near the middle of the eighth century. We estimate that the population of the settlement dropped by almost half between A.D. 725 and 775, probably in response to declining crop yields. Recent stream flow reconstructions for the Gila River by the late Donald Graybill and his colleagues at the University of Arizona tree-ring lab indicate that the amount of water available for

Casa Grande Site Boundary Canal Casa Grande SR 287 SR 87 Compound F central PROJECT AREA m mounds Grewe Site Boundary trash mound compound ballcourt Casa Grande Ruins National Monument prehistoric canal Meters SR

irrigation was highly predictable in the period from A.D. 535 to 725. In contrast, the period from A.D. 725 to 750 was highly variable, with five years of severe drought and five years of very high stream flows and probable severe flood-ing. The Grewe canal system may have been completely or partially inoperative for an extended period of time after the floods of the late 740s.

It is probably no coincidence that Hohokam settlements with strong Middle Gila River ties first appeared in outlying drainages at about the same time that the population of Grewe declined. Archaeologists have generally viewed this so-called "Colonial expansion" as evidence of cultural growth and development. The GARP results paint a somewhat different picture, suggesting that the Colonial expansion may have been less an expression of cultural maturity or entrepreneurial spirit than a response to environmental stress.

The construction of new canals in the late 700s ushered in a new era of economic prosperity for the residents of Grewe. Based on data from a probable main canal built during this time period, we estimate that enough land could have been irrigated to support at least 1,000 people, a figure that is slightly above the 670 to 800 people estimated to have

lived at the site based on architectural evidence. It is not so high, however, as to have provided much of a margin for error in bad years, or much of a surplus in good years. Perhaps for this reason the canal was used for only a short time and then rebuilt and expanded. The new canal held enough water to irrigate 75 percent more land, and it could have supported a population of close to 2,000 people, which is about twice the number of people (780 to 975) estimated to have lived at the site in the early- to mid-ninth century. The potential thus existed to produce a sizeable surplus on a regular basis. The greater the potential surplus, the greater the potential resources available to support individuals not directly involved in food production.

The first of three ballcourts was built at Grewe during the first half of the ninth century. This feature was similar in size and appearance to the massive Court 1 at Snaketown. The Grewe ballcourt may even have been slightly larger, with a playing surface roughly two-thirds the size of a modern football field. Unfortunately, only the floor is still preserved, so the exact size of the berms that enclosed the court remains unknown. Still, assuming they were comparable to the berms associated with Court 1 at Snaketown, we estimate that the Grewe ballcourt required about 1,000 person-days of labor to build. Up to 700 people could have stood atop the berms and watched events that took place on the court below. Most archaeologists believe that a variant of the Mesoamerican ballgame was played on these courts, though the possibility has been raised that they were used for other purposes, such as ceremonial dancing or worship. Regardless, they likely served as integrative facilities that brought together members of the community and helped forge a sense of group solidarity.

The discovery of a communal cooking area with two dozen large earth ovens (hornos) less than 60 meters west of the ballcourt suggests that feasting was another way that social integration was achieved at Grewe. Interestingly, 75 percent of the hornos were used only during the period when the ballcourt was being built, not during later times. Perhaps these hornos were used to cook food for laborers involved in ballcourt construction or facilitated feasting at an inaugural ballcourt event. Large quantities of cholla fruit were processed in the hornos, along with agave hearts, green corn, squash, and steamed greens.

The population of Grewe is thought to have peaked at between 800 and 1,000 people in the second half of the ninth century, making it one of the largest settlements in southern Arizona at the time, rivaled only by Snaketown and possibly a few sites in the Phoenix area. Given the size of the canal system and the number of farmers that presumably shared water rights, it is likely that some form of

centralized authority was required to maintain the canals, coordinate water use, and resolve disputes. But even if this was the case, decisions about what to grow, how much to grow, and what to do with any surpluses that might be produced may have been made by households that prized their economic independence.

Not everyone, however, shared equally in the fortunes of the settlement. Differences in material wealth are evident between both individuals



Half-excavated massive horno (earth oven). Located in a concentration of such features near the ballcourt, these roasting facilities may have been used during feasts at an inauguration of the ballcourt, or perhaps for providing food for ballcourt construction crews.

and households. For example, a wide range of high-status items were recovered during earlier work at the site by the Van Bergen-Los Angeles Museum Expedition (see pages 6-7). Most of these materials were found in association with several cemeteries and an offertory area in the southern part of the site on the opposite side of the main plaza from the large ballcourt. Nothing comparable was found by Northland, even though nearly as many burials were excavated.

Domestic architecture provides another indication that there was an unequal distribution of wealth at Grewe. Although everyone lived in similarly constructed houses (wattle-and-daub), some were much more elaborate than others. Most of the well-made houses were found in one of two courtyard areas believed to have been associated with wealthy households. The wealthiest courtyard area contained five of the ten most "expensive" houses at the site, as determined by an analysis of the labor costs invested in house construction. The proximity of this courtyard area to the communal cooking area further suggests that wealthy households were sponsors of feasts. Sponsoring households presumably gained status and influence within the community as a result of their generosity. Feasting may have

> also served to reaffirm property rights, thereby sanctioning the economic advantages already held by the sponsors.

> For reasons that are still poorly known, the focus of the settlement began to shift from Grewe to Casa Grande in the last half of the tenth century. However, it was not until the second half of the eleventh century, after the large ballcourt had fallen out of use, that the population of Grewe dropped sharply. A new ceremonial precinct with a new ballcourt was probably established at Casa Grande at

#### GARP STATS

Total area investigated: 13 acres Field labor: 14 person-years Backhoe trenches: 3 miles Backhoe-stripped area: 4 acres Dirt moved: 10,000 tons Total archaeological features: > 1,310 Number of structures: 271 Number of pits: 866 Number of purials: 158 Number of canals: 10 Number of artifacts: 450,000 that time. There are indications that new farmland was opened up then as well, due to an increase in the carrying capacity of the canals and the abandonment of existing villages on the west side of the national monument.

A sizeable portion of the population of Casa Grande may have actually resided outside the monument area, at least in the years leading up to construction of the Great House. Three of the four compounds investigated by Northland were occupied and abandoned before the Great House was built (circa A.D. 1250-1325); the fourth was contemporaneous with it (circa A.D. 1325-1450).

Canal Casa Grande, one of the engineering marvels of prehistoric North America, was probably built about the same time as the early compounds. It extended from east of Florence to west of Coolidge, a distance of close to 20 miles. Five



Top: Recent excavations in the Grewe site ballcourt, possibly the largest court ever built by the Hohokam. Photograph courtesy of Northland Research, Inc. Bottom: Ballcourt 1 at Snaketown. Half of the court was excavated in 1934-1935. Similar in size and form to the excavated Grewe court, it provides an approximation of what the Grewe court may have looked like prior to modern land leveling. Photograph courtesy of the Arizona State Museum.

platform mound settlements were spaced at regular twoto three-mile intervals along the canal. Casa Grande was the last of the settlements, overlooking an expanse of irricatastrophic fire took place at the time of abandonment. Pima oral traditions indicate that Casa Grande was one of the first settlements overthrown during the conquest of the

Hohokam by Siuuhu (Elder Brother) and his followers. Apparently the residents of Casa Grande fled to the hills and were defeated there, thus sparing the Great House from further destruction. No evidence supporting or disproving this story was recovered by GARP. We did find a few late Classic period rooms with pottery and other artifacts on the floor, suggesting rapid abandonment, but relatively few of the rooms were burned. The mystery of how and why this ancient town was abandoned must therefore await further research.



two platform mounds and the Great House further distinguished Casa Grande from neighboring settlements. The large size of Casa Grande has led some researchers to conclude that force was required to ensure a reliable water supply for both farming and domestic needs. Others have suggested that the residents of Casa Grande usurped irrigable land from downstream communities to the west. Regardless, few question that Casa Grande was the administrative center for the irrigation system, as well as one of the largest and most powerful settlements in the region.

gable land 50 percent larg-

er than the amount avail-

able to the next largest set-

tlement. The presence of

Most archaeologists believe that Casa Grande was abandoned by A.D. 1450. The presence of charred roof beams in association with the Great House has led many observers to conclude that a

### Preserving the Grewe Site and Its Environs

Jim Walker, Archaeological Conservancy

HE ARCHAEOLOGICAL CONSERVANCY, a

national nonprofit organization dedicated to the acquisition and preservation of significant archaeological sites located on private land, has been working since 1998 to preserve the Grewe site and adjacent archaeological properties. The group has succeeded in the following transactions:

• In 1998, Coolidge residents Jim and Mary Faul donated a two-acre tract, located just north of the new S.R. 287 overpass, to the Conservancy. A portion of this tract was included in the Arizona Department of Transportation (ADOT)/Northland excavations, but part of this two-acre preserve is unexcavated. The Fauls recently agreed to bequeath an additional 30 acres within the known boundaries of the Grewe site north of the overpass to the Conservancy.

• In 1999, the Conservancy purchased 30 acres south of the new overpass in a bargain-sale-to-charity transaction (part donation/part purchase) from landowners Dalton Cole and his sister Darlene Cole Sipes. This transaction was made with the assistance of an Arizona Heritage Fund grant administered by Arizona State Parks. The 30-acre Cole Preserve is the site of the 1930-1931 Van Bergen Expedition excavations. Although the land has been in cotton cultivation for over 50 years, Northland's excavations at the northern edge of this tract indicated significant intact deposits below the plowzone including the southern half of a ballcourt partially excavated within the right-of-way. As part of the project, the Conservancy will be taking this land out of cultivation and returning it to native vegetation. • In 2000, the Conservancy signed a donation agreement with Wal-Mart stores agreeing to accept the donation of approximately 13 acres of land located south of the overpass. This preserve will be an L-shaped parcel fronting S.R. 287 and S.R. 87. Wal-Mart will be building a new store to the south and east of the donated property. This transaction was facilitated by the efforts of the Society for American Archaeology, tribal involvement, and the efforts of many dedicated individual archaeologists. In addition to the land donation, Wal-Mart sponsored an archaeological testing program, executed by Northland Research, Inc., that resulted in significant new knowledge about the spatial structure of the prehistoric community.

The Conservancy is working to acquire more of the unique cultural resources located along the Gila River between Florence and Coolidge with the hope that someday they can be included in an expanded Casa Grande National Monument. Today, Casa Grande showcases the last chapter in the Hohokam occupation of the valley. Grewe, Bisnaga, Adamsville, Stone Hoe, and Clemens pueblos tell the rest of the story. The corridor between Coolidge and Florence is experiencing significant development pressure. In the absence of a county archaeological ordinance, much of what is left will be lost unless we act now to preserve these prehistoric communities. Preservation-minded landowners like the Faul and Cole families, as well as community-minded companies like Wal-Mart, coupled with the opportunities presented by the Heritage Fund, have made the Conservancy's successes with the Grewe site possible.

#### A New View of Bodies in Clay

#### Tina Love, Northland Research, Inc.

Recent excavations at the Grewe site yielded over 200 clay figurines and figurine fragments from a variety of contexts. When compared to Emil Haury's 1976 study of the figurines from Snaketown, interesting differences were found in their production and use. At Snaketown, Haury noted that figurines were found primarily in trash mounds in the early Pioneer period, and in burials in the Colonial and Sedentary periods. Furthermore, Haury saw a general increase in the ornateness of figurines over time. He suggested that there was a change in the function of figurines from a household use to a funerary one. In contrast, in all time periods, the Grewe figurines were recovered primarily from houses, few of the figurines were ornate, and the reported elaboration over time was not apparent. Overall, only the most basic types of figurines were recovered from all of the contexts at Grewe.



At least part of the explanation for the differences in figurine form between the sites can be traced to sampling problems in the Snaketown analysis. A significant percentage of the analyzed figurines for certain time periods were thought by Haury to have been made by single artists. However, the association of elaborate forms at Snaketown with mortuary contexts-a circumstance not replicated at Grewe-could indicate behavioral differences between the sites and greater variability than had previously been recognized.

### Spectacular Finds in the 1930s

Mark Hackbarth, Northland Research, Inc.

HE GREWE SITE is

known for some of the most elaborate and exquisite pre-Classic period Hohokam artifacts ever discovered. And yet, it was serendipity that the Grewe site was excavated at all. The first professional excavations at Grewe began in the 1930s, but events that led to this work could easily have gone awry.

Hohokam sites began in 1927 bone hairpins (right). when Harold S. Gladwin,



Birds and snakes were important icons found on carved bone and shell artifacts Some of the earliest at the Grewe site. Shown here are an focused work at pre-Classic exquisitely carved shell ring (above) and

working for the Southwest Museum in Los Angeles, tested a number of trash mounds, including one at the Grewe site. His work began at the Casa Grande Ruins National Monument and moved eastward, with the expectation that stratigraphic tests would produce evidence of an early Hohokam culture. Prior to this time, archaeologists had only worked at adobe compounds and the only decorated Hohokam ceramics they knew of were polychromes. By testing farther away from Casa Grande, Gladwin hoped to find earlier periods of occupation, and the ceramics that preceded the polychrome series. His work demonstrated that red-on-buff ceramics were made earlier than polychromes.

The discovery of an early Hohokam ceramic series in the Gila River Valley attracted the interest of other archaeologists. In early 1929, Arthur Woodward of the Los Angeles County Museum began work in the valley. His first large-scale project was funded by Charles Van Bergen, a wealthy retired medical doctor who was a member of the Los Angeles County Museum. Woodward wanted to follow up on Gladwin's results and trace the roots of the red-onbuff culture in Arizona. Arthur Woodward served as the project's supervisor while Charles Van Bergen was in charge of finances and overall direction of the project. Van Bergen, Woodward, and Irwin Hayden were the supervisors of the Van Bergen-Los Angeles Museum Expedition to Arizona or, as the archaeologists called themselves, "Van Bergen's gophers." Excavations began at Compound F at Casa Grande in January of 1930, but within a few weeks, their interest was attracted to the Grewe site, less than onehalf mile to the east.

The Grewe site was being leveled for a cotton field and



some of the exposed artifacts were being collected and sold by looters. Among the items that the looters brought to the attention of Woodward were the types of red-on-buff ceramic vessels that could answer his questions about the origins of the red-on-buff ceramics. Van Bergen obtained a lease for the Grewe site, probably from Mr. Mayfield, the tenant farmer. The lease called for the 30-acre Mayfield tract to be excavated and leveled by the archaeologists, while the looters were kept away from the site. The archaeologists were to be finished in time for Mayfield to plant





Above: Van Bergen expedition mapping a pithouse at the Grewe site. Irwin Hayden is standing at the hand-made plane table, Milton Wetherill squats below, Ben Wetherill stands with his back to the camera. The other three workers are unidentified.

cotton in the spring, a deadline that was extended to the following year.

Excavations at the Grewe site used both innovative and traditional field techniques. Although Fewkes had used a fresno scraper and a team of mules earlier at Casa Grande to remove fill from adobe rooms, at the Grewe site this strategy was used to locate houses and cemeteries and to excavate trash mounds. Systematic excavation of shovel test pits was also used to sample the 30-acre project area. Mapping was accomplished with an alidade (a straightedge



Within two weeks of starting work at the Grewe site, Hayden and Van Bergen began recovering unique and special artifacts. Pyrite-encrusted sandstone mirrors, elaborately carved shell and bone tools, and caches of desert bighorn sheep horn cores were found in the southeast corner of the 30acre parcel. Some of the most spectacular artifacts were from the "Shrine Area." Hayden specifically mentioned that the Shrine Area was not associated with any cemetery or isolated human remains. It was, however, immediately adjacent to the largest houses found at the Grewe site. Current analyses suggest that these houses were near a plaza at the center of the site. Their proximity to the caches of extraordinary shrine artifacts was surely no accident.

The 1930-1931 excavations at the Grewe site played a significant role in defining pre-Classic Hohokam material culture. This opportunity could have been missed if Woodward had not seen the looters' artifacts, or if Compound F had more red-on-buff ceramics. Even the site name could have been different—the original name was the Mayfield Tract (the Grewe name comes from the landowner in 1930). Fortunately for us, decisions made by the archaeologists revealed the rare information that could have been lost, if not for a little bit of luck and their professional abilities and intuition.

Two of the pigment-inlay decorated sandstone mirror backs from the "Shrine Area" that are probable imports from West Mexico. The left one (5<sup>1</sup>/<sub>4</sub> inches in diameter) shows macaws, the right one (4<sup>3</sup>/<sub>4</sub> inches in diameter) has a possible deity. The front ("mirror") sides of these remarkable artifacts were originally covered with precisely fitted pieces of iron pyrite. See back page of this issue to see what the "mirror" front of these artifacts would have been like. All photographs courtesy of Van Bergen-Los Angeles Museum Expedition to Arizona, Natural History Museum of Los Angeles County, Anthropology Section Archives.



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### Rediscovering the Recipe for Hohokam Buff Ware Pottery

David R. Abbott, Northland Research, Inc.

DURING THE PRE-CLASSIC PERIOD, when the village at Grewe was inhabited, Hohokam potters mostly fabricated two kinds of pottery, which archaeologists call "plain ware" and "buff ware." Plain ware ceram-

leaves an iron-free, bleached surface. The whitened surfaces gave the potters a light-colored canvas on which to paint their dark red and maroon designs.

Our chemical assays of the clay fraction in buff ware

pieces confirmed that it was high in calcium, rich

in sodium from salt, and

had depleted concentra-

tions of iron. But having

the right ingredients was

not enough to ensure a

pot. Control over the tem-

perature at which the pot-

tery was fired was also

Hohokam craftspersons

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knows today, calcium cre-

ates some nasty technical

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ics accounted for about 70 to 85 percent of a typical household's domestic inventory and mostly functioned as culinary and storage vessels. They were made from iron-rich, brown-firing clays and were rarely decorated except by a few haphazard strokes of the potter's polishing stone.

In contrast, elaborate, red-painted decorations were added to the lightcolored surfaces of the buff ware pottery. Ever since the end of the nineteenth cen-



Hohokam Buff Ware pottery workshop at Snaketown. Note the elongate clay mixing basins (bottom center) and circular firing pits filled with shingling and waste sherds (upper right).

tury, when archaeologists began uncovering and documenting the ancient wares, the buff ware makers have been admired for their eye-dazzling linework forming intricate geometric patterns or the simple artistry of human and animal life forms. New discoveries from Grewe are further enriching our appreciation of the artisans' skills, showing that they were accomplished chemists as well. One of my goals as part of the Grewe research team was to determine how Hohokam pottery was made. Here's what I discovered.

Perhaps by tasting the clay with a touch of the tongue, buff ware potters began by carefully selecting clays that were rich in calcium and salt from among those along the Gila River. To these clays they added even more calcium in the form of powdered caliche, the cement-like calcium carbonate deposits that form in Southwestern desert soils. Calcium has a bleaching effect on the iron colorants in the clay, which in the presence of salt tends to occur when the mixture is heated to about 800 degrees Celsius. In addition, salts in a ceramic paste usually migrate through capillaries to the surface of the vessel walls during drying. On heating, the concentrated salt crystals on the vessel surfaces decompose and then react with iron ions to form ferric chlorides. These chemical compounds readily volatilize in the presence of oxygen at temperatures around 800 degrees, which ing durable clay containers. During the firing process, caliche begins decomposing into lime and carbon dioxide gas at around 620 degrees, and the chemical reaction becomes very rapid at temperatures around 900 degrees. The lime absorbs water vapor from the atmosphere to produce calcium hydroxide. The expanded volume of the hydroxide crystals can create considerable pressure in the fired product and the undesirable effect know as "lime spalling," which can crater the pottery surface and, in the extreme, disintegrate the vessel.

What the Hohokam potters needed was a minimum temperature of at least 800 degrees, when the necessary chemical reactions to produce a light-colored product take place. On the other hand, a temperature surpassing 900 degrees may have been hazardous, increasing the risk of failure due to rapid lime spalling. The assurance of 800 degrees of heat, but not more than 900 degrees, created a narrow target for traditional firing methods.

Among modern potters who use traditional technologies, there are five techniques for firing pots: 1) open fires, 2) open fires with pieces of broken pots used to cover the new wares, 3) pit fires, 4) pit fires with sherd covers, and 5) updraft kilns. All five techniques can accomplish at least 800 degrees, but what is of particular interest is that only the pit-and-sherd-cover method reliably produces maximum



Two magnificent examples of Hohokam Buff Ware pottery. All photographs courtesy of the Arizona State Museum.

temperatures between 800 degrees and 900 degrees. Not surprisingly, the best evidence available for a Hohokam Buff Ware workshop at Snaketown included several pottery-firing pits filled with ash, mesquite charcoal, and numerous large plain ware sherds that had been repeatedly burned. Moreover, the large sherds used to "shingle" the load of buff ware pots also protected the bleached surfaces from carbon blemishes that would have happened if the fuel wood touched the pottery.

When we consider the raw materials and technologies available to desert artisans, we can only admire the potters' ingenuity and skill. A thousand years after their handiwork was made, their artistry delights our aesthetic senses and their resourcefulness piques our scientific curiosity.

#### Obsidian at Grewe-Casa Grande

James M. Bayman, Department of Anthropology, University of Hawaii, and M. Steven Shackley, Archaeological XRF Laboratory, University of California, Berkeley

Obsidian was highly valued by the Hohokam people for making projectile points for hunting and warfare, and as grave goods. Obsidian, a volcanic glass, occurs naturally throughout the North American Southwest. Fortunately, a scientific technique known as "x-ray fluorescence" enables scientists to identify which source provided the obsidian that Hohokam people used in the Sonoran Desert.

Our analyses of obsidian artifacts from the Grewe-Casa Grande site complex (349 artifacts in all) yielded stunning and unexpected insights on the size and organization of the Hohokam regional system. Prior to A.D. 1100, Hohokam people at Grewe mostly used obsidian from nearby sources, such as Superior. In the Classic period (A.D. 1150 to 1450), however, Casa Grande residents imported their obsidian from a variety of distant sources near Flagstaff (Government Mountain), Wickenburg (Vulture), Gila Bend (Sauceda), and western New Mexico (Mule Creek).



In short, networks of obsidian circulation enlarged greatly during the Classic period as community centers with platform mounds and "Great Houses" acquired nonlocal obsidian from a vast territory that rivaled the scale of the pre-Classic networks for marine shell, pottery, and copper bells.

Archaeology Southwest

## Refining the Hohokam Chronology

Henry D. Wallace, Desert Archaeology, Inc.

**T'S NOT JUST ANOTHER PRETTY POT!** The beautiful Middle Gila Buff Ware pottery illustrated here, and in the preceding article, documents key points in the history of prehistoric Hohokam design development. They offer a visual sample of the results of a study I initiated as part of the Grewe Archaeological Research Project. The study had, as its primary goal, the refinement of the Middle Gila (also called Hohokam) decorated ceramic sequence.

Middle Gila Buff Ware pottery is commonplace in the Phoenix and Middle Gila area, and it is relatively abundant at archaeological sites throughout much of central and southern Arizona. During the 1930s, a series of buff ware ceramic types dating from about A.D. 650 to 1400 were defined by Emil Haury and Nora and Harold Gladwin. The types were defined with the goal of documenting the sequence of design change through time, and stratigraphic data were used to both build and bolster the proposed sequence. They formed the basis for the Hohokam culture phase sequence, and they are the very backbone of most chronological schemes developed for the southern Arizona desert since that time. This means that when an archaeological deposit with this type of pottery is excavated, phase assignments and date ranges typically rely on Middle Gila Buff Ware ceramic type identifications. The one-to-one correspondence of ceramic types and phases in the Hohokam chronological sequence means that the spans of time associated with phases of cultural development are



Naturalistic designs on Middle Gila Buff Ware. Photograph courtesy of the Arizona State Museum.

1300	Prior Sequence	Proposed Time Sequence	Newly Defined Ceramic Types
1200 —	Soho	Soho	Casa Grande Red-on-Buff
1100 —		Late Sacaton Middle Sacaton 2	Late Sacaton Red-on-buff Middle Sacaton 2 Red-on-buff
1000 —	Sacalori	Middle Sacaton 1 Early/Middle Sacaton Early Sacaton	Middle Sacaton 1 Red-on-buff None Early Sacaton Red-on-buff
900 —	Santa Cruz	Santa Cruz	Santa Cruz Red-on-buff
800 —	Gila Butte	Late Gila Butte Early Gila Butte	Late Gila Butte Red-on-buff Early Gila Butte Red-on-buff*
700 —	Snaketown	Undifferentiated Pre-Late Snaketown	None
* There are also red-on-gray types for these time segments.			

tied to the definition of the ceramic types. If the ceramic type definition changes or if the definition fails to reliably mark a span of time, then the phase associated with it changes or becomes invalid.

Haury established a series of seven basic ceramic types

in the buff ware series upon which the Hohokam sequence was established, and he estimated phase lengths of equal 200year spans. Investigations at a wide range of sites in the 1980s and 1990s resulted in large sets of new dates and collections of pottery, and the spans of time linked to the ceramic types were repeatedly adjusted. Most researchers would now agree that the phases/types do not span equal periods of time; indeed, they range anywhere from about 25 years up to 175 or more years in length.

As the research questions being asked of Hohokam archaeology became increasingly refined, requiring fine-scale dating that exceeded the limits of radiocarbon assays, and as increasing data suggested ambiguities in how the ceramic types were defined by different researchers, it became clear that the ceramic sequence required a fresh look. What was needed were replicable type definitions and a sequence that was substantially more refined than what had been in use since the 1930s. The basic type sequence was recognized to be valid, but the precise pathways of design development were not known, and the different approaches taken by various ceramicists needed some basis in fact.

Developing a refined seriation of the sort envisioned in this study requires analysis of collections of pottery from specific deposits that are believed to be relatively unmixed with earlier and later material (rigorous criteria were developed to reliably measure this). Many such deposits are required and, in order to be useful, there must be adequate numbers of decorated sherds within them large enough for analysis. I evaluated the pottery from hundreds and hundreds of excavated contexts stored at the Arizona State Museum and Central Arizona Project Repository with these thoughts in mind; only 24 met the requirements. Ideally, all such deposits would be stratigraphically interrelated. Of course this was not the case, so a statistical ordering technique called multidimensional scaling was used. By evaluating how similar the design characteristics are in the pottery from context to context, a sequence was developed that hinges on the assumption that stylistic change follows a logical pathway.

Once an ordering of contexts was accomplished, the design traits that could be used to define newly refined types were reviewed. To be useful, the trait combinations must be common







enough to apply to contexts bearing a dozen or more decorated sherds. Many traits and trait combinations were considered. It was ultimately possible to define eleven spans of "stylistic" time, with nine of these spans accompanied by newly defined buff ware ceramic types. The period seriated (ordered) runs from the Snaketown to the Soho phases of the Hohokam sequence, from about A.D. 700 to 1300. Where there had previously been five phases and types, now the figure is twice that. Most importantly, two portions of the sequence, the Gila Butte and Sacaton spans, were significantly refined, thereby suddenly opening the door to substantial improvements in cultural-historical reconstructions. For example, using the refined seriation for a reanalysis of ceramic collections from three excavated early ballcourts (Grewe, Snaketown Ballcourt 1, and La Ciudad), I found that all three were built in the Late Gila Butte phase rather than early in the Gila Butte.

The study is not complete. Buff ware from additional highquality contexts will be analyzed and added to the seriation to improve the resolution and accuracy of the sequence, and testing by multiple researchers will be required to evaluate and refine it. It is possible that additional refinements can be made, and it is likely that the sequence can be extended to include earlier and later deposits than were included in the original seriation. In addition, we have not assigned calendrical date ranges to the refined types; that can only be accomplished once additional dating clues are considered.

Changing styles of pottery design permit refinement of the Hohokam pottery sequence. The illustrations of actual pots shown here represent some of the changes in the Sacaton series. The sequence proceeds from Early Sacaton (top) to Middle Sacaton 1 (middle) to Middle Sacaton 2 (bottom). Drawings by Ron Beckwith.

Archaeology Southwest

# Back Sight

NARECENT VISIT to the Natural History Museum of Los Angeles County, I had the opportunity to see the unique mirrors recovered from the Grewe site excavations in the 1930s (pictured on pages 6 and 7). It is always a treat to see the actual artifacts that you have previously seen only in photographs. However, for understanding the Grewe site, this issue of Archaeology Southwest is a much greater treat.

The Grewe Archaeological Research Project, or GARP, shows us that Grewe was a special place-both for its large size and its longevity, and because it was a stage in the development of the community that featured the remarkable Casa Grande at its center. Early work at Grewe documented some of the most important "high status" artifacts known from the Hohokam region. Now, GARP has revealed that Grewe contained "common people" in some abundance. We know a great deal more about the people's houses, their irrigation canals, their daily foodstuffs, and how they traded for needed goods such as pottery and obsidian. New advances in Hohokam chronology have also been made.

How does the work at Grewe relate to the Center's mission of preservation archaeology? In several ways. First, it illustrates the importance of partnerships to

fund preservation archaeology. GARP was carried out within the framework of contract archaeology and was funded by the Arizona Department of Transportation (ADOT). Fortunately, the catalyst of the ADOT/Northland work helped the Archaeological Conservancy secure state funds and land contributions by the Faul and Cole families and Wal-Mart. The result is that 75 acres of the Grewe site are now protected. And the Archaeological Conservancy is working to secure even more key site areas within the larger Grewe-Casa Grande community.

Second, the Center chose to bring some of its private funds to this partnership because GARP represents a very highquality "package" of information. It is a case study of contract archaeology at its best. It also includes multiple examples of the productive roles of archival and museum studies-research tools that are at the heart of preservation archaeology.

A key Center goal is to assist in getting substantive research results out to a broad, general audience. Therefore, we will continue to seek partnerships that feature the best from the world of contract archaeology. That is where most archaeology is being carried out in the U.S., and such partnerships allow scarce financial

resources to be stretched. The benefits are multiple, but the most important beneficiary is the fragile archaeological record.

See the Center for Desert Archaeology website for more information: <a href="http://www.cdarc.org">http://www.cdarc.org</a>

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Partly restored mirror front from Nayarit, Mexico, showing precisely ground and fitted polygonal wafers of polished iron pyrite. Though tarnished now, the original surface would have

had a brilliant golden metallic sheen. Photograph courtesy of the Arizona State Museum.



6/illa: 21. Doelle