La Jornada
Papers in Honor of William F. Turney

CONTRIBUTORS

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David M. Brugge
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Carol J. Condie
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Wesley R. Hurt
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Charles H. Lange
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Gordon Page
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Curtis F. Schaafsma
Polly Schaafsma
Mary M. Turney
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Statements and interpretations presented in the articles are those of the author or authors and do not necessarily reflect the opinions of the Archaeological Society of New Mexico or its individual members.
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AWANYU: This quarterly journal was discontinued December 1977. For back issues, contact COAS Publishing and Research at the above address.

AWANYU NEWSLETTER: Distributed to members only. No back issues in print.)
Preface

In 1979, with our infant daughter, Leyla, we moved into a late-1930s house in Mesilla Park. Across the street was an abandoned brick building surrounded by a dirt lot—the original Mesilla Park Elementary School built just after the turn of the century. Today the building is the Mesilla Park Recreation Center, with meeting rooms, baseball fields, a basketball court, and a playground. Shortly after moving into our home, we visited with Bill and Mary at an ASNM annual meeting, where we learned that Bill had grown up in a house nearby and attended this school and that his sister had lived within a block of our house. Bill often spoke fondly of the times he spent in Mesilla Park.

A few years later, Human Systems Research, Inc., was contracted to conduct test excavations at the McSween House Site in Lincoln, New Mexico. One of the requirements of the project was to establish a long-term grid system. Bill, with his mountain transit, directed David in setting up the grid system. As David pounded 3-ft-long rebar stakes into the ground, Bill watched him through the transit and made sure he was “on the mark.”

Over the years, Bill shared his knowledge of the archaeology of New Mexico and especially of the Jornada del Muerto. He worked on a wide variety of projects across New Mexico and was especially interested in prehistoric water control. All of us will miss his smile and thoughts about the lives of prehistoric and historic peoples of New Mexico.

The Archaeological Society of New Mexico, through publication of La Jornada, recognizes and honors Bill's contributions to the archaeology of New Mexico.

Meliha S. Duran
David T. Kirkpatrick
Editors
March 1996

The editors wish to thank Bonnie E. Elder (Busy B.E.E.'s Typing, Las Cruces) for her assistance with and contributions to the desktop publishing for this volume.
William F. Turney and Snoopy, June 1980.
"Archaeology is often enriched by the strengths brought to it by those trained in other disciplines," says Laura Holt, librarian for Museum of New Mexico, Laboratory of Anthropology in Santa Fe. She was talking about William Forbes Turney.

A respected civil engineer whose work is found in the remotest corners of the state, Bill Turney brought to archaeology the meticulous investigative methods of his trade and the discipline to work from hard facts, rather than theory. As a rancher’s son bred in the rugged expanses of south-central New Mexico, he also brought along a reverence for the land and a bond with the people who share it over time.

Archaeology was an avocation to which he hoped to contribute his particular talents in some small way. But by the time of his death in 1994, he had become an invaluable resource, friend, and partner to many of the region’s outstanding archaeologists and anthropologists.

Turney worked as a volunteer on landmark projects throughout the region. He assisted Dave Kirkpatrick at the Alexander McSween home site in Lincoln and traveled to Casas Grandes, Mexico, with Fred Wendorf, to report on sanitation and underground ditches for Charles DiPeso of the Amerind Foundation. When bodies of Confederate soldiers were discovered in a common grave near Glorieta in 1987, Bill worked with the research section of the Laboratory of Anthropology to develop a strategy for surveying the battle site.

Always willing to share his knowledge with others, Turney taught surveying at an Archeological Society of New Mexico field school near Gallup and instructed archaeologists contracted by Los Alamos National Laboratories in aspects of surveying a site prior to excavation.

Bill was “quite sensitive to the failure of many archaeologists to locate their excavations in terms of legal survey markers. He was constantly urging archaeologists to locate their work to the nearest bench mark and to describe their work locations in legal surveying terms,” says Curt Schaafsma, curator of the Laboratory of Anthropology. He remembers reviewing one of Turney’s surveys that particularly impressed him—a reservoir in Pueblo Blanco—that was “recorded as precisely as if it had been a lot recorded at a local country courthouse.”

In semireirement, Bill used his expertise as a land surveyor to map Indian ruins,
particularly prehistoric reservoirs in the Gallina country (he handled the transit or alidade while his wife Mary carried the rod). His reports and maps are on file with the Bureau of Land Management, Museum of New Mexico, and U.S. Forest Service. In 1984, Bill and Mary Turney jointly received the Governor’s Award for Historic Preservation in recognition of their volunteer efforts in recording archaeological sites in New Mexico.

Turney was born in 1914 in Mesilla, New Mexico, the son of C. T. Turney and Bessie Baugh Turney—the youngest of 13 Turney children. Baptized in the kitchen sink by the well-known Episcopalian minister, Preacher Lewis, Bill was named after Civil War veteran and neighbor, Texas rancher William Forbes. Bill’s father, C. T., ran several businesses in the farming community. He attended grade school in Mesilla Park and rode his horse to Las Cruces High School.

But young Bill’s heart was always at the “Jornada,” the family’s 20-by-50-mi spread of desert rangeland northeast of Las Cruces. Bill spent his preschool days at the ranch at his father’s side.

Later, during the summer months, he rode on horseback across the 1,000-section range, often following old Apache trails or the swales of Spanish carretas and merchant wagons that once braved the Jornada del Muerto (Dead Man’s Journey) on a desolate stretch of the Camino Real that traversed the property. It was typical to be out all day without a lunch, dipping a hat into spring or windmill storage tank to slake a thirst. Day’s end might find him miles from home, camped under a canopy of stars. “Son,” his father advised, “always eat a good breakfast, because you’ll never know when you’ll eat again.”

In 1914, C. T. Turney signed over a sizable piece of his ranch to what was then the New Mexico College of Agriculture and Mechanical Arts to establish the Jornada Range Reserve for studying the impact of grazing on arid land. During the 1920s, the Turneys lost the Jornada Ranch to drought and the Great Depression, but a portion of it survives as part of an experimental site for agricultural research at New Mexico State University.

Bill was active in Scouting and earned his Eagle Scout Award. One summer he led members of the Buffalo Indian Clan from the Ruidoso Scout Camp to a narrow canyon on the Ruidoso River, where they painted designs on the rocks and on cliffs 15 ft up, using scaffolding. In 1957, an archaeologist wrote that the paintings were probably done by Mescalero Apache shortly before 1900. Bill later admitted to Polly Schaafsma what the scouts had done.

In 1938, Bill graduated from NMSU with a bachelor of science degree in civil engineering, a minor in architecture, and a commission as Second Lieutenant in the Army Reserve.

In the years between graduation and World War II, Bill met his future wife, Mary Aileen McCauley (they married in 1941), and worked for the International Boundary Commission in Las Cruces and for the U.S. Grazing Service, designing dams and reservoirs.

During World War II, Bill was assigned to the U.S. Army Corps of Engineers in Belfast, Ireland, designing critical war-time infrastructures: heavy bomber fields, roads,
bridges, and hospitals. In the summer of 1944, he was promoted to Major and shipped to Paris to head the General Construction Section that, along with other projects to rebuild France, reinforced the Eiffel Tower and the city’s famous Opera House. Bill became a familiar figure in the City of Light, riding his big red bicycle to explore and sketch the city’s architectural treasures. By the end of the war, he had advanced to the rank of Lieutenant Colonel.

Anxious to reunite with Mary and to work on rebuilding his own life, Bill Turney returned to New Mexico after the war, this time to Santa Fe, where he was employed by the R. O. Ruble Engineering firm. Three years later, he purchased the firm with Gordon Herkhoff, to form Herkhoff and Turney. He broke away a few years later to form his own company, W. F. Turney and Associates, a name that engendered respect and trust across the state throughout Bill Turney’s life.

Turney rapidly gained a reputation as an authority in the treatment of municipal wastewater. He designed the treatment centers at Las Cruces, Albuquerque, Santa Fe, Las Vegas, Los Alamos, Española, Taos, and Clayton.

These and other major projects—the Buckman Water Line to Santa Fe, the Albuquerque Sewage Treatment Plant, and a 70-mi water line to Alamogordo and Holloman Air Base from Bonita Lake in the Sacramento Mountains—enhanced his reputation, but it was some of the smaller jobs of which Turney was proudest.

Over several years, W. F. Turney and Associates designed and installed community water systems that brought safe water to homes in more than 160 villages, sharply reducing the infant mortality rate. The state provided $12,000 per community toward purchasing materials—water tank, pipes, and wells. Working with the local population, who donated land for the water tanks and dug the trenches for the pipeline, the projects were completed. Today, the old well-house doors still display the engineer’s trademark—a coat of “Turney blue” paint.

Bill’s fieldwork as an engineer often took him to remote areas of the state, sometimes to sites pocked with ruins. Some had already been identified; some had not. He often relocated pipelines and structures to avoid sites. During construction of an airport in Crownpoint, Bill worked to realign a runway until it missed nine ruins located in its proposed path. Bill’s concern for preservation and his cultural sensitivity were by no means limited to New Mexico sites. During World War II, he was instrumental in relocating a project in Ireland after frantic locals warned him the proposed airstrip ran through a Fairy Circle!

Though a thriving career and a wife and five children left little free time, Turney did manage to squeeze in an archaeology class at the College of Santa Fe taught by Charlie Steen. It was love at first lesson; he was hooked for life. Bill and Mary became active members of the local Archaeological Institute of America, Santa Fe Chapter, and the Archaeological Society of New Mexico. In the Santa Fe group, they helped organize and lead bus trips from Santa Fe to interesting sites around the Southwest.

From then on, family vacations consisted of treks by travel trailer to the hinterlands of New Mexico and western Colorado, including favorite campsites in the mountains near Reserve and in Navajo Land. The Turney kids, Patricia, Tom,
John, Marie and Billy, often accompanied their parents on day-long hikes. Lunch breaks usually found dad recording a site or land feature with pencil and sketch pad.

Maps, sketches, and reports bearing the name of William F. Turney will survive and strengthen the study of New Mexico's ancient cultures for years to come. So will the gifts of friendship and scholarship he extended to all he met along the way. The Archaeological Society of New Mexico respectfully dedicates this volume to the work and memory of William Forbes Turney.

—Santa Fe

WILLIAM F. TURNLEY
RÉSUMÉ

**Anthropological Society Affiliations**

Archaeological Society of New Mexico (ASNM)
Archaeological Institute of America, Santa Fe Chapter
Arizona Archaeological and Historical Society
New Mexico Archaeological Council

**Offices Held**

Archaeological Society of New Mexico
  Board of Trustees
  Instructor, Archaeological Mapping, ASNM Field School at Heaton Canyon, 1985 and 1986
  Specialist in Archaeological Mapping, Provisional Surveyor

Archaeological Institute of America, Santa Fe Chapter
  President and Vice President
  Chair, Field Trip Arrangements Committee

**Awards**

Governor's Award for Historic Preservation (with Mary M. Turney), 1994, in recognition of their volunteer efforts in recording archaeological sites in New Mexico.

Archaeological Society of New Mexico Amateur Award, 1985.
**Past Experience**

University of Calgary: mapping and instrument tie-in for Robinson Site

U.S. Forest Service, Santa Fe Forest: site mapping and recording on Golondrina Mesa and at Tsiping Ruin

U.S. Forest Service, Lincoln Forest: site mapping and recording on Nogal Mesa

National Park Service: studies of prehistoric water-control systems in Chaco Canyon and Wupatki National Monuments

Museum of New Mexico: site mapping and instrument tie-in of Rocky Arroyo and King Ranch sites (Chaves County), description and mapping of Native American water reservoir at San Lazaro Pueblo (Santa Fe County)

Human Systems Research, Inc.: site grid system, McSween Site (Lincoln County)

Independent: prehistoric water reservoir studies near Llaves (Rio Arriba County), Jemez Pueblo (Sandoval County), and Pueblo Blanco (Santa Fe County)

**Publications and Manuscripts**


1988 Historic and Prehistoric Survey, City of Santa Fe, N.M., Airport Road Wastewater Treatment Plant.


Mary Turney
1985  Historic and Prehistoric Survey, Union County, N.M. Neighborhood Facility

1985  Historic and Prehistoric Survey, Town of Taos, N.M. San Juan-Chama Water Supply and Transportation System.


1980  City of Aztec, N.M., Raw Water Reservoirs, Archaeological Survey.


The Santa Fe Society of the Archaeological Institute of America (AIA) was formally organized on February 12, 1916, at a regular meeting of the Archaeological Society of New Mexico (ASNM). This event was reported in El Palacio (1916a). The proclamation read in part: "The Santa Fe Society of the AIA is formed to promote Archaeological research, to stimulate the love of art, and to contribute to the higher culture of the southwest." There were 69 charter members; Frank Springer was elected president; Major Rufus J. Parker, treasurer; Paul A. F. Walter, secretary. Annual dues were $10.00, with membership in ASNM included, and AIA was to provide lectures on art and archaeology.

THE EARLY DAYS

However, that being fact, the use of the name Santa Fe Archaeological Society predates this event by at least 16 years. In her history of the Archaeological Society, reported in El Palacio, Hulda Hobbs (1946:82) quotes Dr. Edgar L. Hewett as recalling: "Preliminary work on the archaeological society was in the fall of 1898, when the society was organized informally in the drawing room of Secretary of State and Mrs. George H. Wallace in the Palace of the Governors." Two years passed with Hewett giving lectures to interested groups and running field schools. In 1900, Hewett was director of New Mexico Normal School in Las Vegas. He and his students spent the summer studying the Jemez, Santa Clara, and Rito de Los Frijoles Sites. Again, as recounted by Hobbs (1946:86–87), on the way back to Las Vegas, they apparently stopped in Santa Fe where Hewett presented a "free lecture at the Court House on the pre-historic remains near Santa Fe." After the talk, a meeting was held at which the Santa Fe Archaeological Society was born. On September 14, 1900, the newspaper The New Mexican recorded the event, quoted here in part: "At a well attended meeting at the court house last evening the Santa Fe Archaeological Society was formally organized by electing Judge J. R. McFie President, Prof. J. A. Wood Vice-president, W. A. Barney Secretary and Librarian..." (Hobbs 1946:4:87). One month later, on October 12, at a second meeting, bylaws and a syllabus prepared by Hewett were adopted. This activity, I believe, is recognized as the start of ASNM, but as we shall see, this group functioned also as the Santa Fe Archaeological Society for nine or ten years.
For the next series of historical data we can thank the availability of the secretary's minutes for SFAS from 1906 to 1916, available in the archives of the Laboratory of Anthropology Library, as well as Hobbs' (1946:7:176) article in El Palacio. According to Hobbs and the minutes, the first meeting was on March 15, 1901, which was not recorded until the next meeting on April 23, 1906. Hobbs speculates that the reason for the inactivity may have been Hewett's absence from the scene. At the later meeting, the group not only approved the minutes of that last one in 1901, but also pledged to "reorganize for future work." There were three more meetings in 1906, at which Hewett gave lectures, and the society was resolved to urge Congress to set aside Pajarito Park. Eighty-eight members were reported in May, and the group "made plans to publicize the cliff dwellers...to attract tourists." There appears to have been only one meeting in 1907, at which plans were made to approach AIA to become a local chapter; 129 members were recorded. The single meeting in 1908 was held primarily to mount an "effort to extend membership to all the larger towns in the Territory." There were 170 members from all over New Mexico at the time of the March 11, 1909, meeting, at which the first mention of the name of the Archaeological Society of New Mexico was made. Hobbs counts this as the start of the State Society, but the actual adoption of a new constitution officially naming the Archaeological Society of New Mexico was on August 12, 1910. The minutes record that "There were 195 members located in all parts of the Territory." Judge McFie was elected president, and most of the officers of the Santa Fe Archaeological Society were elected to positions. Thus the Santa Fe Society name fades for six years, but obviously the same individuals were involved, whatever the name of the organization.

The new organization met on August 20, 1910, to dedicate the Museum of Archaeology in the old Palace of the Governors. There appear to have been no more meetings of any kind for over three years. Several writers, including Hobbs, speculate that this was in part the result of intense efforts to achieve statehood for New Mexico and the hoopla surrounding the plans for the inauguration of Governor William C. McDonald in January 1912. As a matter of fact, the secretary's notebook of minutes for the years from 1906 to 1910 actually became the recording ledger for the inaugural committee established in 1911. Paul A. F. Walter, the founder of El Palacio in 1913, was secretary of both organizations. Also of great distraction to Hewett and his associates were preparations for the Panama-California Exposition in San Diego. As Malinda Elliot (1987) relates in her history of the School of American Research (SAR), "In 1911 he was appointed director of all exhibits for the Panama-California Exposition, and from then until the exposition opened in San Diego on the last day of 1914, Hewett's staff worked intensely on the preparation of elaborate exhibits on the Science of Man" (p. 24). They were also probably involved in the construction of the New Mexico Building for that exposition, which was designed by Isaac Rapp.

Another construction project was taking place during these same years. In 1907, the backing of his friends at the Smithsonian, especially Alice Cunningham Fletcher, AIA had elected Hewett first director of the School of American Archaeology. By late 1908, he had convinced AIA to locate the school in Santa Fe. The New Mexico Territorial Legislature in 1909 established
the Museum of New Mexico and named Hewett as director. Shortly thereafter he persuaded them to grant AIA use of the Palace "free of rent" as the seat of its school, with the understanding that the School of American Archaeology would fix up the premises. At that time, the historic Palace of the Governors was in disrepair. Carl Sheppard (1988), in his book on Isaac Rapp and the Santa Fe Style, recounts the events leading up to the renovation of the Palace. In 1910, a long territorial-style portal existed along the Palace Avenue side of the building. Jesse Nusbaum and Sylvanus Morley were given the task of rebuilding it. The Palace facade prior to the 1913 renovation appeared similar to the present Casa Sena block of east Palace Avenue. Carl Sheppard recounts that, although Rapp’s firm had done a few Santa Fe Style structures by 1912 (the Colorado Supply Store at Morley, Co., and the New Mexico building for the Louisiana Purchase Centennial Exposition), he was not actively involved in the Palace project. After seeing a picture of the Colorado Supply Store, Morley, with Rapp’s permission, designed the new Spanish-Pueblo style portal. Nusbaum oversaw the construction, which was completed in late 1913. The whole undertaking was fully reported in the first issue of *El Palacio* (1913). Excellent before and after pictures also appear side by side in *El Palacio* (1916b).

Considering all these activities by Hewett and his staff, it is no wonder they had little time for archaeological meetings during this period. But the absence of Hewett and the resultant lack of formal society functions underscore the enormous influence he had on the life of archaeological societies in Santa Fe and New Mexico. However, when ASNM finally did get together in late 1913, the interest stimulated by all those activities sparked a huge growth in membership of the society. By October 1916, there were 446 members in ASNM. The group met five times in 1914 and 1915, and at a meeting held on October 12, 1915, a committee was formed to petition AIA to establish a local branch in Santa Fe. Thus, on February 12, 1916, the Santa Fe Archaeological Society was officially born under the name of the "Santa Fe Society of the Archaeological Institute of America." This is the date AIA recognizes as the beginning of its twenty-third chapter.

**THE MIDDLE YEARS**

The ledger for the Society stops with the 1916 entry, but *El Palacio* recorded meetings of both ASNM and SFAS from 1916 through the 1930s. It counts four SFAS meetings in 1917, and five in 1918. In its July issue, *El Palacio* (1919:21) reported: "During the past year the activities of the SF Society of the AIA were merged entirely in those of the School of American Research (formerly called the School of American Archaeology) and the Museum of New Mexico." This is the first real proof that Hewett’s operations and associations were actually the same. Frank Springer was still president, and the objectives, dues, and benefits were those put forth in 1916. Joint meetings were held between 1919 and 1923, with lectures provided by AIA as well as Hewett and others speaking on Southwestern subjects.

At this point there appears another ledger, retrieved from Hewett’s files at SAR by Peter Dechert in 1971. Dechert passed it along to Charlie Steen, who gave it to Bill Turney. Mary Turney was kind enough to make its contents available for this study. The notebook contains the
minutes of the Santa Fe Society of AIA from 1923 to 1935. The first entry records a joint annual meeting held July 28, 1923, Mrs. Hewett V-pres. presiding. Dr. Hewett stated the reason for holding the annual meeting at this time is because of readjustments being made in the Institute, and the need to differentiate the officers of the Society from the School by changing those of our Society. Moved that Judge O.L. Phillips be tendered presidency of the Society, & that Dr. Hewett be asked to interview him.

Mrs. Hewett was elected one of three vice-presidents; Paul A. F. Walter was elected treasurer (he was also treasurer of SAR at that time, so much for differentiation!); and Mrs. Van Stone, secretary.

The next meeting was called on August 9, 1924, to decide to "incorporate under the law of N.M. A charter & by-laws drafted by Hon. F. Springer were accepted." Afterwards, O. L. Phillips was elected president; Paul A. F. Walter, vice-president; K. M. Chapman, treasurer (rectifying the separation of offices with SAR); and Mrs. Van Horne, secretary. Although El Palacio (1924:85-86) also reported this activity, no actual evidence of incorporation could be located. The December 22, 1924, meeting was a joint one, with the Santa Fe Society called to order by Mr. Walter, and the New Mexico Society by Will Barker. The joint meeting presided over by Mr. Bloom heard a "talk on Post-Basket Makers and pre-Pueblo sites by Mr. Guernsey." "Mr. Bradfield told of his recent work in Mimbres field."

The October 18, 1925, meeting of the Santa Fe Society is of great interest. Abbie M. White, one of the White sisters extensively involved in SAR and Santa Fe social life, had died on May 12, 1924. In her will she made the following bequest: "To the Trustees of the Santa Fe Society of the Archaeological Institute of America, the sum of ten thousand (10,000) dollars, to be used for the purposes of said Society." A letter dated July 22, 1924, was read at the meeting from the administrator of the estate relating the bequest and explaining that it consisted entirely of first mortgages. The minutes record "a resolution which is attached to this record authorizing Dr. Hewett to represent this Society." The minutes continue:

Resolved, that Edgar L. Hewett, Director of the Museum of New Mexico and the School of American Research of Santa Fe, N.M.,....is hereby fully authorized and empowered to enter into any agreement on behalf of the Santa Fe Society of the AIA in the settlement of the legacy to the Society by the late Abbie M. White.

A similar letter was recorded by El Palacio on June 2 (1924:11:16), but it was dated May 22, 1924. This meeting was also recorded in El Palacio (1925). Lisa Lashley, a long-time member of the current SFAS, found the letter to the Society dated July 22, 1924, from the administrator Francis H. Rawley, in files on AIA in the History Library on Washington Avenue in Santa Fe. After the initial letter, there ensued a series of letters between Rawley and Paul A. F. Walter, secretary of the "New Mexico State Museum," attempting to convert the mortgages to cash. The exchange of letters continued until May 5, 1925, where the paper trail ends. At one point in February 1925, a note to Rawley from the Secretary of the Managing Committee of SAR states:
"The Society has made building plans for this year which depend very much on the early payment of the bequest and anything you can do to facilitate this will be appreciated." No record has been found of whether the mortgages were ever cashed or, and if so, what the disposition of the moneys may have been. What might the building project of the Society have been? Again, no known record has been found to date. The timing of the resolution at the October 18 meeting, over a year after the bequest, only heightens the mystery!

The subsequent meetings held in the late 1920s and early 1930s were much less eventful. The two societies met jointly in 1926, 1927, and 1928 to hear lectures by Hewett and AIA-sponsored speakers. Professor Louis F. Ford spoke on Roman villas; Professor W. F. Albright on the dawn of history in the Jordan Valley; John F. Dupre on the Great Pyramid; Professor Etienne Renaud on the earliest known man. Hewett, himself, gave a talk on April 12, 1927, on Archaeological Reconnaissance in North Africa. And so it went through 1928. Most of the gatherings took place in the Fine Art Museum on Palace Avenue, followed by tea served by the Women’s Museum Board. Judge Phillips had been president since 1923. At the annual meeting of the Society on December 15, 1927, held "around the fireplace in the Art Museum," Judge A. J. Abbott was elected president; Mrs. Hewett, vice-president; Charlotte Arnold, secretary; and K. M. Chapman returned as treasurer. The annual meeting of the Society in 1929 was held on December 30 to elect new officers. "Dr. Hewett referred to past presidents, Judge Abbott and Judge Phillips, and the policy of having the office of president filled by a layman who has an active interest in the Society, and nominated Mr. James G. McNary." Mrs. Hewett and Miss Arnold were reelected, and Paul A. F. Walter returned as treasurer after several years as vice-president. There appears to have been only one meeting in 1930. An AIA-sponsored lecture by Dr. Louis N. Lord on Aegean Islands was reported by El Palacio (1930), but not recorded in the ledger. After two attempts to obtain a quorum, the only meeting in 1931 was convened at 5 o-clock in the Hall of Indian Art in the Art Museum. The reports of the Secretary and Treasurer were read and approved. Out of the 69 members of the Santa Fe Society, 26 are residents of Santa Fe. Mr. Walter nominated Ex-Governor H. J. Hagerman to fill the vacant office of President of the Society.

Mrs. Hewett was reelected vice-president; Miss Warfield, secretary; and Mr. Walter returned as treasurer. After this meeting held on November 3, there does not appear to have been another one until 1935. The last entry in the minutes is dated March 1, 1935. It reads in its entirety as follows: "A meeting of the Santa Fe Society was called for, the evening, March 1, 1935, but a quorum was lacking, and no election was held. Officers will be appointed by the executive committee."

**THE EMPTY YEARS**

After 1932, it is more than evident that SFAS lost major support. An addendum to the 1931 meeting information reads: "It is planned to have a drive for membership during the month of January (1932), when Dr. Hewett has promised to give time to the matter." Obviously the effort fell short, as the lack of a quorum at meetings over the next four years clearly demonstrates.
Not only had the country fallen into the depths of the Depression, but Hewett was spreading himself too thin. Malinda Elliot (1987) sheds considerable light on all he was involved in. In 1921, he had set up a school for novice archaeologists at Battleship Rock in the Jemez Mountains, and in 1929, he initiated a program for advanced students in Chaco Canyon. Quoting from Elliot:

Hewett also established a similar Department of Archaeology and Anthropology at the University of Southern California in 1932. He was now dividing his time between administering the School (SAR) and the Museum, heading departments at two major universities, and overseeing excavations, as well as teaching advanced field schools in Mexico and South America. [1987:30–31]

Although in 1935 he did resign his position at the University of New Mexico, he began an ambitious writing program and was still the guiding force at the Museum of New Mexico and the School of American Research. It is no wonder he failed in a membership campaign. This lapse in laymen interest without Edgar Lee Hewett's leadership once again demonstrates the tremendous influence he had in Southwestern archaeology and on the societies that grew out of the awakened interest in archaeology among the general population.

Although the Santa Fe Society did not meet, its affiliation with AIA was maintained. AIA annual bulletins from 1936 to 1939 list Mrs. Hewett as acting president, and the number of active members between 12 and 15. No national AIA lecturers were sent to Santa Fe during those years. In the 1940 bulletin, Dr. Reginald Fisher of SAR is shown as president. It would appear that SAR again assumed an active relationship with AIA. This affiliation continued to 1970.

In 1956, a group led by Charlie Steen, a long-time National Park Service archaeologist, organized a new Santa Fe Archaeological Society not affiliated with AIA. All involved were individual members of AIA, were either professionals in the discipline or National Park Service employees, and also felt that a Santa Fe society should exist separate from SAR. Notes compiled by Al Schroeder, another Park Service archaeologist, show that the society formed on January 29, 1956. "One day a month to be on field work. Constitution and by-laws presented and ratified. Officers elected. Plan to affiliate with ASNM." H. H. Patterson was elected president; Paul Franke, Jr., vice-president; Oriol Grand-Girard, recording secretary; Mrs. Jack (Justine) Thomas, corresponding secretary; D. L. Leisher, treasurer; and Charlie Steen, advisor. Later that year, permission was sought to excavate at La Cieneguilla, a site south of Santa Fe. Schroeder's notes record meetings in 1956, 1957, 1958, and 1959. W. J. Keller was installed as president at a January 6, 1957, meeting where Stewart Peckham showed slides of his work in New Mexico. There was usually a speaker at every meeting. At meetings in 1958, Steen spoke on archaeology of the San Juan Basin, Peckham spoke on salvage excavations near Abiquiu Dam, and Marjorie Lambert spoke on the Mayan ruins of Central America. S. Joe Thomas was elected president in 1959; Carlson, vice-president; Elizabeth Curl, recording secretary; Oriol Grand-Girard, corresponding secretary; Betty Toulouse, treasurer; and Charlie Steen, advisor. At least some members excavated at La Cieneguilla in the summers of 1957 and 1958, led by Stewart Peckham. But by 1960
interest lagged; the few meetings held that year were unrecorded, and the group became inactive.

Dr. Frank Mera of SAR is shown in the AIA bulletins as president of SFAS from 1941 to 1956, and J. Avery, treasurer of SAR, was treasurer. During all these years, SFAS was in fact integrated into SAR. In the 1950s and 1960s, AIA bulletins show continued activity with Santa Fe through SAR. Boaz W. Long appears as president in 1957, with Oliver Seth as secretary and J. Avery still as treasurer. John Gaw Meem was president in 1964, 1965, and 1966. Membership was counted at 20. In 1967, J. C. Woolley became president, and Douglas W. Schwartz was secretary. Membership was up to 31. Schwartz had become Director of SAR on July 1 of that year. For several years he promoted AIA speakers, and ever larger crowds attended each lecture. Then in 1970, Schwartz decided he did not want to sponsor the national speaker program any longer, since AIA policy states that the talks must be open and free to the public. Schwartz wanted SAR to hold a lecture series as a way to promote his school’s membership program. For a modest fee, anyone could join SAR and attend its lectures. Thus in 1970 Schwartz, who is shown in the AIA bulletins of 1968, 1969, and 1970 as both president and secretary, notified AIA that he wanted to discontinue the affiliation.

THE REBIRTH

For the next chapter of SFAS history, we are lucky to have a taped conversation with Charlie Steen, as well as taped comments on that conversation by Marjorie Lambert. According to Steen, there were a number of Santa Feans involved in SAR who strongly objected to Schwartz’s intention to drop AIA sponsorship, but he remained adamant to do so. One of them was Catherine Sellers, wife of the noted archaeologist, August Sellers, who was then living in Santa Fe. Failing to convince Schwartz, she “invited Bertha Dutton and my wife Mary and [me] to an evening discussion and asked what in the world we could do about this. After a lot of discussion and with not too much enthusiasm from me, it was decided we would set up a committee and sponsor these lectures ourselves” (Steen, tape interview by John Rinehart, 1992).

Although from Steen’s account they did not formally organize a chapter for a year or two, the AIA bulletins for 1971 and 1972 show him as president, with Doris K. Lester as secretary. It would appear from all evidence provided in Steen’s and Lambert’s recollections (M. Lambert, tape interview by Jim Duncan, 1995), that the society had by 1973 formally organized with Charlie Steen shown by AIA as president, and Ruth Leakey as secretary. According to Steen, the first lecture held in the winter of 1971 was a disaster! “The hall was the gymnasium of the Santa Fe Prep. School. It was pretty miserable and we had 16 or 17 listeners with a very good talk by a man from the Smithsonian.” At this time Mary Steen stepped in and suggested “the best way to get people together was to sit down and eat something. So we instituted the potluck dinners.” These meetings proved immensely popular with everyone going to a member’s house for dinner, then on to a public place for the lecture itself. The State Land Office was used for the lectures, as was the Folk Art Museum. Steen had retired from the Park Service in 1970 and began teaching an archaeology course at the College of Santa Fe. This greatly stimulated interest in the new organization, and by 1975, the group were forced to move the dinners and
lectures to hotel banquet rooms to accommodate the increased membership. La Fonda Hotel, the Desert Inn, and La Posada were initially used. Around 1973, the society began their field trips. Steen claimed he dragged his heels on this idea, as he had on the dinners, but once again others prevailed. “The first one was to Chaco Canyon, the Aztec Ruins, and the Salmon Ruins. The second trip, we swung down to El Morro, through Zuni, and up to Gallup and back” (Steen interview, 1992). Those two trips were made by auto-caravan, which the Society found too dangerous, because of the pile-up of traffic when everyone stopped to view a point of interest. A chartered bus was used for the 1975 trip to Socorro, Silver City, and the Gila River Valley. The driver, Robert “Jenks” Jenkins, was so compatible with the membership that he conducted the annual trips until retiring in 1992.

Lionel Boettcher was elected president in 1974, with Jean Padilla as secretary. Thus begins the modern era of the Santa Fe Archaeological Society, with the Society growing steadily to almost 200 members today. Records from 1975 to 1995 exist in Society files. These include lists of officers, active members, lecture topics, speakers, and annual field trips. A final chapter of the Santa Fe Archaeological Society will be compiled from these and subsequent issues and presented in conjunction with the 100 anniversary of the Archaeological Society of New Mexico in the year 2000.

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—Santa Fe

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EPISODES OF COMPUTER USAGE IN FIELD AND LABORATORY

Richard A. Bice

Bill Turney, the honoree for this volume, was a civil engineer who received wide acclaim in his own specialty of hydrology.

My friendship with Bill began in the mid-1950s when I was serving on the Albuquerque City Commission and Bill was the Consulting Engineer on a City public works project. As engineers we had much in common, but because he lived in Santa Fe and I in Albuquerque, it was several years before we discovered our mutual interest in archaeology.

As a student of archaeology, Bill brought his expertise to bear on the interpretation of ancient water uses and resources. Then too, through seminars and informal exchanges, he generously contributed much time and effort to the archaeological community by teaching many of its members the use of engineering instruments and mapping techniques essential to fieldwork.

But beyond these traditional engineering field instruments, a number of other technical tools have become available for archaeological use in recent years. As an example, the personal computer (PC) was immediately found effective and has been universally accepted.

Thus, as a tribute to Bill, perhaps it is fitting for me to cast an engineering perspective on some uses of this computer tool, by presenting selected episodes that relate to archaeology in the field and laboratory.

THE COMPUTER, A CENTRAL ELEMENT

The purchase of a PC was very high on my personal list of priorities when they reached the market in the early 1980s. My first computer and its successors immediately became essential parts of the archaeological programs that I was supporting on behalf of the Albuquerque Archaeological Society (AAS) and the Archaeological Society of New Mexico (ASNM).

Three capabilities are central to the computer's role: preparing drawings, processing and calculating data, and processing words. Only the first two are discussed in this paper, since word processing is ubiquitous and well understood in all fields.
DRAWINGS OF FIELD MAPS

The use of computers for making drawings is encompassed under the term of Computer-Aided Design (CAD). CAD, with its versatility and ease of use, is an improvement over drawing by hand, in much the same measure as word processing is an improvement over using the manual typewriter.

In contrast to other software programs such as Paint or Draw, which are artistic in nature, CAD is aimed at precision drawing of engineering designs. It uses a digitizing board and a special mouse to execute a design or to make tracings of existing pictures and drawings. The drawing is placed on the screen and then stored in the computer's permanent memory, from which it can be retrieved for refinements or printing.

The drawings used as examples in this paper have been taken from various AAS and ASNM field programs, and unless otherwise noted, were made using the DesignCad 2D and 3D computer programs of American Small Business Computers, Inc.

Drawings for Use in the Field

Because of the volunteer nature of the archaeological work carried out by these two Societies, it was necessary to schedule field activities with significant time gaps between sessions. AAS conducted its programs over weekends when favorable weather conditions could be expected, whereas ASNM carried out its field school once each year during the whole month of July.

In both cases, an important factor in providing continuity was the preparation of drawings of those portions of the sites that had been initially mapped by hand in the field. These drawings, entered into the field books, could then be easily built upon as new work was undertaken and new elements were exposed during each field session. Although this technique was used prior to the availability of the computer, the computer drawings are decidedly more flexible in meeting individual field requirements. They can be easily combined, separated into parts, or changed in size as the needs dictate.

The example shown in Figure 1 was taken from the AS-8 program sponsored by the Bureau of Land Management and AAS. It involved a Pueblo-III pueblo that was mapped, partially excavated, and then stabilized. As the field program developed, a progressive survey was undertaken to determine room positions. A map of a group of interrelated rooms was placed in each feature book to provide room outlines that could be used for further detailing and elaboration.

The upper part of the figure shows a basic map of several rooms as it would have appeared in a field book. The lower part of the figure is a drawing of one of the rooms containing details that were added over the extended period of time required for room excavation.

As work on the site advanced, individual drawings were fitted together in the computer to make progressive site maps.

Composite Drawings Made from Layers

A technique called Layers in CAD language allows a number of individual drawings to be stored under a single
Figure 1. Use of Room Outline to add details during Excavation.
drawing title. The layers can be combined in any manner to make composite drawings.

Room A1 at Site AS-6, a P-III pueblo near Quemado, NM, that AAS excavated, is shown in Figure 2. The layer technique was used to separate five elements of the room as follows: Layer 1, the main walls; Layer 2, the artifacts on Floor 1; Layer 3, an interior wall constructed after the main walls had been built; Layer 4, the artifacts on Floor 2; and Layer 5, two firepits in Floor 2.

In the lower part of the figure, these layers have been combined into two finished drawings, showing Floor 1 and Floor 2, respectively, together with their contents.

Another example of using layered drawings is taken from the Vidal Site program, near Gallup, NM. This site was excavated by ASNM over a period of more than a decade. It contains a Great Kiva and some earlier structures. As the project grew, layers were used to keep track of feature locations and numbers.

Figure 3 shows the drawing layers for the Vidal site as follows: Layer 1, the basic layout of the site; Layer 2, the contour map of the site before the start of excavation; Layer 3, the early set of grids that were laid out for making surface collections; Layer 4, excavation grids over the entire site, excluding those related to the Great Kiva; Layer 5, the initial grids used for cross-trenching the Great Kiva; Layer 6, mid-term Great Kiva grids; and Layer 7, the final configuration of Great Kiva grids.

From these layers, any combinations can be chosen to prepare needed drawings. Two examples are illustrated in Figure 4. The drawing at the top combines Layers 1, 3, 5, and 6 to show surface-collection grids together with early and mid-term Great Kiva grids. The lower drawing is a combination of Layers 1, 2, 4, and 7 showing excavation grids over the entire site and their relationships to the surface contours.

FROM ANGULAR PHOTOGRAPHS TO HEAD-ON DRAWINGS

The analysis phase of any archaeological program may indicate where needed information was omitted from the field notes or drawings. However, photographic documentation, if conscientiously performed in the field, can often help to provide missing details. Nevertheless, the angle of view of a photograph may leave something to be desired, since field situations often make it impossible to take a true head-on picture, either vertically or horizontally.

A good software program such as CAD provides a method for rectifying such a photographic view into a true elevation view or true plan view. Using the two-dimensional CAD system, a drawing is made by placing the photograph on the digitizing board and tracing it with the mouse or pen. It can then be transferred to the CAD three-dimensional system and further processed. The final drawing is then converted back to the two-dimensional system.

Figure 5 illustrates this process. In the AS-8 program, a part of the southeastern stone wall enclosing the pueblo plaza had toppled as a section. Field notes were taken, and the dimensional outlines of the fall were drawn, but the details of the individual rock sizes and positions were recorded only by a slant photograph.
Figure 2. Layers used to make different composite drawings.
Figure 3. Layers used to compose drawings shown in Figure 4.
Layers 1, 3, 5, and 6.
Surface Collection and early Great Kiva Grids.

Layers 1, 2, 4, and 7.
Final Site Grids with Contour Lines.

Figure 4. Vidal Site grid drawings composed of selected layers.
Figure 5. Fallen wall drawings before and after being rectified.

The digitized drawing that was traced from the photograph is shown on the left side of Figure 5. A meter scale and grid strings, which were included in the photograph, determined the placement of the vanishing point for this perspective drawing. The vanishing point and the near end of the fallen wall formed the bounds of the triangle shown in the figure. The triangle was then truncated at the top, to fit the far limits of the wall.

The scale and grid strings also determined the size of the rectangle and the shape of the desired plan view.

The computer process uniformly stretched the contents of the truncated triangle shown on the left, until its four corners matched the corners of the rectangle shown on the right.

THREE-DIMENSIONAL DRAWINGS

Contour maps are good examples of how to present three-dimensional information in a two-dimensional format. While such maps provide important information needed in archaeological work, 3D contour pictures can provide additional insights. Such pictures can be generated by 3D CAD programs or by other types of graphic software. In the first example, Figure 6, a program called Perspective Junior, part of Three D Graphics, was used.

Figure 6 is a "wireframe" contour map that shows the elevation of grid lines over a contoured surface. The subject is the preexcavation contours of Site AS-6, investigated by the AAS.
Figure 6. AS-6 site contours.
On this site were two occupational components, a small P-III pueblo and a very shallow P-II pithouse. Pictured at the top part of the figure are contoured, .5-m grid lines, in which the vertical drawing scale is the same as the horizontal scale. The northern edge and corners of the pueblo mound can be seen along the top of the map. However, the modest outline of the mound and the gentle slope of the land toward the south are about the only contour details that meet the eye, either when visiting the site or when looking at the drawing.

However, if the vertical dimensions of the drawing are greatly exaggerated, as shown in the bottom map, not only does the outline of the pueblo mound show more distinctly, but another slight mound can be seen as a subtle change in the grid pattern near the center lower end of the site. This spot is the location of the pithouse. If we had had access to this technique when the site was excavated, it might have saved some exploratory field time.

Another type of three-dimensional drawing, fully pictorial rather than wireframe, aids in understanding complex structural arrangements. An example, shown in Figure 7, is taken from the Great Kiva of the Vidal Site, excavated by ASNM. The picture is a graphic reconstruction of the approach and entryway into the kiva. Because of the tumbled and deteriorated nature of the area, interpretation was very difficult. The process of developing a three-dimensional drawing aided greatly in reconstructing the probable configuration.

**STRUCTURAL ANALYSIS**

The analysis of structures, including the calculation of beam sizes, provides another opportunity to apply engineering principles to archaeology. For the following example, a hand calculator was used for the math, but the computer was used for the drawing. (Editors' note: programs that emulate high-powered calculators are available for computers.)

In the Vidal Great Kiva, the large roof beams, primary and secondary, had been removed before or after a fire that burned the remaining roof material. Thus, no samples were available to allow measurements to be made on the beams. However, using other data, the lengths can be estimated and the diameters calculated.

The distances are known between the wall and the roof support columns and among the columns themselves. Also the weight to be supported, including secondary and tertiary beams, latillas, brush, soil, and snow loads, can be closely approximated.

Using these data, and theorizing possible arrays for the placement of the primary beams, a likely support arrangement for the roof was determined, as shown in Figure 8. It seems certain that the primary beams rested on the columns, forming a rectangle in the center of the kiva. A minimum of six beams would have been needed, double beams on the northwest and southeast sides of the rectangle and single beams on the other two sides. Some of the secondary beams radiated from the primary beams, to be supported at their outer ends by the kiva wall. Others were placed across the center rectangle and supported by the inner member of the double primary beams.

In calculating the beam diameters, it was assumed that the builders either had some background in designing and building kivas, or that they had access to those who did.
Figure 7. Section of entryway into Vidal Great Kiva.

Figure 8. Kiva roof configuration used to calculate beam sizes.
Among other things, they would have been guided by the fact that what feels right may be right. This means that the following beam sizes were calculated to provide a roof that would not have felt springy when walked upon.

The required diameter for each of the six primary beams would have been between 41 and 51 cm (16 to 20 in.). The secondary beams, between the primary beams and the wall and across the center rectangle, would have been from 15 to 23 cm (6 to 9 in.) in diameter, if placed on about 61-cm (2-ft) centers. Tertiary beams (latillas) covering the areas between the secondary beams were recovered in large numbers and averaged about 8 cm (3 in.) in diameter.

**DATABASES**

All disciplines that manage masses of data use databases and/or spreadsheets, whether the subject is financial, scientific, personal, or other. However, since each discipline has its own techniques, the following examples draw on generic archaeological methods developed for AAS and ASNM projects.

Very early in any field project, codes are adopted to replace more lengthy titles or descriptions. Since these codes also play a key role in the later data analysis, it is important that their application to databases be kept in mind as they are developed. This will aid in making full use of all data, whether collected in the field or obtained in the laboratory.

**Examples of Databases**

In Figure 9 follows the logical development and use of several theoretical databases. The flow starts with information collected in the field, adds information from the laboratory, and ends by fashioning a Painted Ceramic Database.

The figure contains five abbreviated listings, arranged to show the flow of data. List 1, called All Artifacts Database, contains the following information on the artifacts as they were gathered in the field: Feature Number, Specimen Number, Artifact Types, and Vertical Provenience.

*Feature Number.* The assignment of feature numbers to locations on a site is an important task. Each number relates to a given area that was chosen for investigation. If the sizes of features are sufficiently fine grained, they can also serve as the horizontal provenience code. If not, another or alternate set of entries, relating to more exact positional coordinates, may be needed. In the examples that follow, it is assumed that the feature number also acts as the horizontal provenience.

A series of F numbers is suggested for the feature code, starting with F01. If 1 is used instead of 01, computer sorting may go awry and not provide the desired sequences.

*Specimen Number.* Each listing is a specimen bag of one type of artifact that was taken from a given feature at a given vertical provenience. Here again, it is suggested that the numbers start with 01, or perhaps 001, if the numbers are expected to run higher than 99.

*Vertical Provenience.* For purposes of this example, codes have been defined as LA Numbers and LN Numbers standing for Level Arbitrary and Level Natural, respectively. The first code relates to the volume of fill between two discreet levels, such as 0 to 10 cm below datum. The second set relates to the volume between
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**Figure 9. Development of Painted Ceramic Database.**
two natural levels, such as surfaces left by different periods of occupation.

Artifact Type. In this example, the different types of artifacts were coded using abbreviations: Ceram, Lith, Bone, Char/Wd, Shell, etc. They can also be assigned code numbers.

List 2, Sorting for Ceramics, was obtained by sorting List 1 so that each type of artifact could be separated into its respective group and then extracting the ceramics group. This list provides a record of all specimen bags, by feature, that must be taken into the laboratory for identifying and describing the sherds.

As the normal first task in the laboratory, each artifact is marked with its feature and specimen number. This will make it possible to trace the artifacts through the field and laboratory notes, and also to retrieve them for any additional information that may be needed during the analysis and writing phases of the program. This marking is also important when debugging and correcting database listings.

During this laboratory phase, the codes that have been used in the field must be supplemented by codes that relate to the typologies and descriptions of the artifacts.

Ceramic codes may describe well-accepted types, perhaps modified to include varieties or local attributes, or they may emphasize descriptive elements, such as surface treatment and temper.

Examples of type/variety codes are A3a = sherd tempered Santa Fe Black-on-white; A3b = siltstone or fine sand-tempered Santa Fe Black-on-white. Examples of descriptive codes are U1a = Corrugated plain, unindent ed, singly tempered with sand; U5c = Corrugated, smeared coils, faintly indented, doubly tempered with sand and high in quartz crystals.

Other ceramic attributes must also be coded: form, such as bowl or jar; characteristics such as handles, lugs, gaming pieces, worked sherds, drilled holes, etc. In addition, matching sherds or jar assemblies must be noted.

The results of the laboratory work are contained in List 3, Input from Laboratory. Completion of this work allowed List 4, Ceramic Database, to be formed by combining the field information from List 2, with the laboratory information from List 3.

As the final step in Figure 9, List 4 was sorted to separate the utility and painted wares, the latter of which is shown in List 5, Painted Ceramic Database. This database has the following headings:

Row Number. Sequential numbers that make it possible, after sorting the database, to resort it into its original form.

Feature Number. Horizontal provenience.

Specimen Number. The specimen bag number for a given type of artifact recovered from a specified Vertical Provenience within its feature.

Vertical Provenience. Codes relating to arbitrary or natural layers. In F01, they relate to natural layers.
**Painted Wares.** Codes referring to type names, varieties, and/or descriptions. In this example, they relate to type/local variety.

**Bowl/Jar.** Code 1 = bowl, unpainted; Code 2 = bowl, painted; and Code 3 = jar.

**Other Attributes.** Traits such as handle, drilled hole, and in the case of Code 6, gaming piece.

**Notes.** Special notes as well as sherd assembly information, coded with a V Number.

**Count.** Number of sherds in a given row. Note: If the Painted Wares column specifies the same type in adjacent rows, this might be interpreted as dual entries, but this is not the case, since entries in the same rows are different in at least one of the other columns.

**Uses of the Databases**

Sorting is one of the most powerful tools of a database. It was used in Figure 9 to obtain List 5, the Painted Ceramic Database. That same list is now used as the starting list at the top of Figure 10. It was sorted by the Notes column to group each matching set or assemblage together, so that the position of each sherd on the site could be determined. The sorting produced List 6, Sort for Matching Sherds. An example from this list is assemblage V06, which came from five different specimen bags and three different vertical proveniences in Features 25 and 28.

Another tool, called Query, can extract specific details from any database, but its limitation is that the results are presented in the same format as the database from which it came. No example is included herein.

For additional flexibility in presenting data, the format of a spreadsheet is often needed. From it, various other charts and graphs can be prepared. The method for converting from database to spreadsheet will depend on which type of software is being used. Quattro Pro by Borland Corporation was used in the examples in this paper, and a macro program was developed to facilitate conversions to the spreadsheet form.

A spreadsheet is presented as List 7, Percentages of Painted Ceramic Types vs Feature Numbers. It lists the number of sherds of each painted ceramic type against the features from which the sherds came.

The graph that is superimposed on the spreadsheet displays the total percentage of each type or variety of pottery contained in the spreadsheet. It is an illustration of one of many graph forms that are available with different software programs.

**CONCLUSIONS**

In writing this paper, it was my hope that this presentation of episodes of computer usage in field and laboratory work would help round out the repertoire of tools that are available to archaeologists in handling data and presenting results. To some it may be familiar ground, but to others it may serve to enlarge their vision.

— Albuquerque
Figure 10. Examples of data taken from Painted Ceramic Database.
Caches are probably common features throughout the world, but they often represent idiosyncratic solutions to emergencies rather than a routine practice. Two areas where caching was or still is culturally standard behavior are the Subarctic and the Great Basin (d’Azvedo 1986; Helm 1981). While not entirely lacking elsewhere in the Southwest, caches are especially common in the Dinetah during a period of dense Navajo settlement from about the mid-eighteenth century back into the seventeenth century and perhaps earlier.

The reasons for the popularity of cache usage during this period are not entirely clear. Some caches may be the result of beliefs similar to those of traditional Navajo that certain artifacts and materials, once they have served their purpose for humans, should be deposited in a place where they may safely return to the earth. Other caches were doubtless meant for temporary storage. Navajo oral traditions often tell of visits to caches of foodstuffs to obtain supplies. Sacred materials may be stored away from the owner’s home, a practice that was apparently more common in the past (Frisbie 1987:100–102). Deposited materials found in an archeological context cannot be separated confidently in many cases into those meant to return to the earth and those intended for later use. Furthermore, the near abandonment of the Dinetah area took place as a result of Ute and Comanche raiding about 1750, which probably meant that much of what was cached for storage was never retrieved.

There are, in Navajo archeology, two classes of caches that can be distinguished on the basis of contents. The first consists of utilitarian goods such as foodstuffs, tools, containers, raw materials, and the like. Most of these caches were probably intended for retrieval and use, but certain artifacts, when badly damaged or worn out, were normally left in out-of-the-way places to return to the earth. These include pottery, basketry, weaving tools, native weapons, and probably other objects.

The second category consists of ceremonial objects, such as masks, sacred materials for medicines, paints, rattles, and bundle prayersticks, as well as less sacred things used for costuming and more prosaic raw materials that might not acquire a holy character until put to use in ritual.

In the Dinetah, finds of utilitarian objects and materials have been the most common. Ceramic vessels and digging sticks seem to be among the more frequent finds, but
basketry, weaving tools, cut sticks, and even a possibly cached metal ax have been found (Carlson 1965:40, 43–44; Hester 1962: 103–25; Marshall 1991:83–85, 144, 176–177, 180, 182, 250, 273–281).

Aside from formal granaries, utilitarian caches were expedient affairs with little or no preparation or modification of the natural features within which materials have been found. It should be noted, however, that very few caches have been recovered under conditions where data were adequately recorded. A great many finds have been reported, with their location and form described only in general terms. Many of those reports are dependent on the accuracy of the informant’s memory or willingness of the finder to provide a faithful description. More are represented only as objects in museums and private collections.

Data on caches of ritual materials are somewhat better, but they seldom meet professional standards of recovery and they are frequently subject to the same doubts attached to utilitarian caches. Many of the finds are reported to have been stored in pottery vessels (Carlson 1965:47; Hester 1962:105, 113, 119). The monetary value of some could lead to the production of fakes. It is unfortunate that the authenticity of the one fully excavated cache (DeHoff 1977) is the most suspect.

Ceremonial objects from dwellings augment those from caches to help provide a picture of Navajo ritual in the Dinétah. As with caches, it is believed that most of these finds date from about the mid-eighteenth century or earlier, but none can clearly be dated prior to the Spanish colonization of New Mexico in 1598.

**CACHE ARTIFACTS**

The objects discussed here are primarily those found in Palluche Canyon. Unless otherwise specified, they are from LA 6532, the Palluche Canyon Cache (Brugge 1994). Many of the items from sites in Palluche Canyon are parts of costume and equipage for dancers. Correspondences of archaeological materials with modern Navajo performers are seldom perfect, but often close enough that some figures can be matched with known Navajo supernaturals.

**Headdresses**

There are several headdresses done in a technique that I call rod-frame. Slender rods, most if not all formed from stems of the three-leaved sumac, are tied, usually with sinew, in patterns with diverse associations. All are mounted on wooden rings that formed a base on the performer’s head. They can be divided into three basic types: ladder-like, tablita-like, and conical.

The ladder-like headdress frames (Figure 1) are mounted so that they would be in a horizontal position when worn. The five to six rungs are therefore vertical and extend above the top of the frame. All of the frame, except the upper tips of those vertical rods and the distal ends of the framing rods is wrapped with cornhusk. The assumption that the vertical rods supported feathers seems a logical conclusion. Polly Schaafsma was the first to recognize that these artifacts were not upright ladders, but horizontal frames for a type of headdress seen in Navajo rock art, especially in the lower half of Largo Canyon and its tributaries (see Fox 1984:cover for illustrations; Hadlock 1980: Figures 10 and 13; Olin 1984:Figures 14 and 24; Schaafsma 1992:Figure 33). Two forms are present in the rock art: one with short
horizontal frames with 4 to 10 feathers; the other a trailing headdress looking somewhat like the tail on a Plains warbonnet, but with only a few widely spaced feathers. The shorter style is apparently no longer in use, but the trailing headdress is worn by performers in Coyoteway, a curing ceremony still known to a few singers. Both the headdress itself and a representation of it in sandpaintings appear in Coyoteway (Luckert and Cooke 1979; Wheelwright and McAllester 1956). It resembles a prototype from which the Plains headdress might have been developed. Although the original inspiration need not have been Navajo, a connection with the Plains Apache may be indicated.

The tablita-like headdress has five uprights and three horizontals tied in a grid or lattice pattern, making a semblance of a Pueblo tablita headdress. This was probably decorated with an array of feathers. Neither rock art nor ethnographic usage features this form of headdress today, but some figures in sandpaintings from Waterway and Beautyway wear headgear that may be based on this kind of lattice. These consist of five vertical tiers of three feathers each, a configuration that would fit well on such a framework (Wheelwright 1946:194–197; Wyman 1970:Plate 32; Wyman 1983:Figure 34). The most likely prototype for this headdress is, of course, the head tablita of Pueblo costuming. Adaptation of what is probably a Subarctic technique of construction to achieve an effect similar to a Pueblo headdress is the most economical inference here.

Strictly speaking, the conical headdress departs from a true cone in different ways;
two variants are represented. In the most common form it consists of four uprights that curve to meet at a point about one foot above the basal ring, the tips crossing and perhaps providing a place to tie feathers. The rods are wrapped with cornhusk, and cornhusk braid was tied along the length of each rod, but only pieces remain in place today. The other form, known only from one specimen at the Maxwell Museum, has two rings, one forming the base and the other tied to the uprights about 7.6 cm (3 in.) above the first. The uprights are shorter and more curved than in the first variant.

These two forms resemble headdresses worn in the Matachines Dance, as performed in Pueblo Indian and Hispanic villages in New Mexico today. The taller form might be compared to a bishop’s mitre or to the Aztec royal copilli, while the shorter form suggests a kind of crown formerly worn by European kings (Treviño and Gilles 1994). The Matachines Dance of New Mexico is a blend of Spanish and Aztec elements. The headdresses from the caches are no longer worn by the Navajo, but a pyramidal hat worn by the Fringed Mouth God and some other performers may well derive from it. The Wand Dance performers, for instance, wear this pyramidal headdress and carry trident wands that are like the palmas carried by the Matachines line dancers who wear a mitre or copilli-like headdress. Both wear ribbons to add color to their costumes. The crown headdress is worn by the monarca (monarch) in the Matachines Dance. I feel there can be little doubt that these headdresses were used in a local Navajo adaptation of the Matachines dance, introduced possibly by Pueblo or Mexican Indians. The ceremony has been lost, but parts have been incorporated into native ceremonialism where they have acquired new meanings congruent with Navajo religious concepts.

Thus, this versatile technique of rod-frame construction was applied to the production of headdresses deriving from three very different traditions, one perhaps an Apachean innovation, one of Puebloan origin, and one having roots in Meso-American and European cultures.

**Rattles**

Twelve gourd rattles and the handle for another were a part of the Palluche Canyon cache. They are much like rattles carried today by Navajo masked dancers, but the handles are longer and slimmer and their distal ends project farther out of the gourds. In this respect, they better match the rattles depicted in sandpaintings than do those now in use.

Two rattles have distinctive elaborations that are significant, rod-frame halos. The more complete specimen (Figure 2) has two rod hoops, one large and one small, attached to the handle so as to form two concentric circles around the gourd. A 12-angled zigzag rod between the circles completes the design. The second rattle apparently had only a single halo, but sufficient parts of the artifact have been lost so that details cannot be reconstructed.

Rattles with halos appear in Navajo rock art. Only two are known to me, but both are carried by figures with vertically divided body color, and one figure has a bow. These are close enough to the Fringed Mouth Gods to be considered early variants of the type. As already noted, the rod-frame technique appears to be northern, and here it was used in a manner so similar to the rod halos on Northern Athabaskan and Eskimo
masks as to appear to be derived from a common prototype (Honigman 1981:Figure 12).

Bows

Both Palluche Canyon collections include bows that are so roughly carved as not to be considered fully functional for archery. They are painted in red and black and have double curves. One variety of these matches the bow carried today by the Fringed Mouth of the Land, and the other resembles the one carried by the Huntress Goddess. The double-curved bow is also a northern trait that appeared in the Southwest in Pueblo IV times (Farmer 1955).

Arrows

The most dramatic specimens from Palluche Canyon are rainbow arcs composed of nine curved, painted slats mounted on a basal stick, and concentric rod arcs that support cornhusk feather holders. Three of these are in the Museum of New Mexico collection, and one is at the Maxwell Museum. The one at the Maxwell has a portion of a hide bag inside the arc, with both the bag and arc painted black with radiating stripes, the pattern that appears on the hump of the Gánaskidi or Humpback God in sandpaintings (Faris 1990:Plates 3, 4, 12, 16, 18, and 22). The many Gánaskidi depictions in the rock art of the Dinétah are shown wearing similar humps with elaborate rainbow arcs decorated with radiating feathers (Hadlock 1980). A Pueblo prototype lacking the rod-frame is carried in dances
among the Tewa (Kurath and Garcia 1970:18).

**Crowns**

Both the Gánaskidis and the Fringed Mouth Gods wear basketry crowns on their masks. Seven of these crowns are included in the Palluche Canyon cache. All have the bottoms cut out in typical fashion, but the rims have also been cut away, indicating that the original baskets were larger than those most common today. All but one of the baskets lacked any original design, suggesting that baskets made for utilitarian use were recycled as crowns. The interiors of the crowns were painted red and the exteriors, black. Simple designs in zigzag lines, slanting lines, and panels were applied to the exteriors in lines composed of pitch. An application of gypsum crystals provided a finish that would sparkle in firelight when the dancers performed at night. Radiating carved wooden feathers were attached to the rims of the crowns. Most of these had become detached, but pairs of holes punched near the rims showed where they had been. Each set of feathers is so distinctive in carving style and in the red, black, and white designs that they can be sorted relatively easily (Figure 3). A minimum of six sets is represented.

Three other basketry crowns are known from the Dinetah. Two of these are in the Maxwell Museum cache, which also includes several carved feathers similar to those described above. Except that the exterior design on one of these crowns is applied in white paint, they differ in no significant respect from those at the Museum of New Mexico. The carved feathers do not match the holes in the rims of the two crowns and quite clearly were used on a missing specimen. The third example comes from an unidentified site in the Farmington area and is among the Bureau of Land Management collections on deposit with the Museum of New Mexico. It fits the general pattern of the others but is less well preserved.

As noted, these crowns are worn today by both the Gánaskidi and Fringed Mouth Gods. They also appear in sandpaintings of these supernaturals (Faris 1990:Plates 3, 4, 12, 16, 18, and 22). They are rarely included in the rock-art depictions of these personages, however. One panel in Delgadito Canyon shows crowns on Fringed Mouth Gods, but in side view, whereas the sandpaintings depict them as seen from below. The absence of crowns in so much early rock art may indicate that they were added to the costumes at a rather late date.

**Hand Tablitas**

Another notable artifact type from Palluche Canyon is the hand tablita (Figure 4). These were produced in the tablet techniques of Southwestern costuming but are designed to be carried in the hand rather than integrated into the dress of the dancers. Most are rectangular and range in size from about 13–18 cm (5–7 in.) vertically by 18–24 cm (7–9½ in.) horizontally. A few are of a two-step terrace shape, and there are also some oval examples. A slot near the lower edge is large enough to accommodate the fingers. Painted designs include corn plants, rainbows, cloud terraces, and geometric figures done in black, red, green, or blue and yellow on a white ground. One unusual specimen combines rainbows with a Christian cross and a crescent nazbah of the Arabic style introduced to the New World by the Spanish. Most, perhaps all, hand tablitas were made in pairs; the designs matching but having subtle
Figure 3. Carved wooden feathers for decorating basketry crowns. (Photograph by Robert la Plante.)

Figure 4. Hand tablita decorated with a cloud terrace flanked by sun dogs. (Photograph by Robert la Plante.)
differences that may relate to the hand in which each was to be carried.

Hand tablitas are no longer a part of Navajo dance paraphernalia, but somewhat similar tablitas appear in performances among both the Rio Grande and the western Pueblos. Those from Jemez in the collections of the Museum of New Mexico are most like the Navajo type, but none for which I have data match it exactly.

Two examples of Navajo rock art illustrating what appear to be hand tablitas are known, both identified initially as such by Hugh Rogers. In addition, a pair of hand tablitas was recovered from another cache. These have a painted design very similar to some in the Palluche Canyon collection (Hester 1962:113–114). Another tablita, suggested to be a head or mask tablita, is from a cache found in Pump Canyon north of the San Juan River (Carlson 1965:48–50; Hester 1962:113–115). This piece is incomplete but resembles hand tablitas in the Rio Grande style in the collections of the Museum of New Mexico. A double row of holes drilled along one side are like those in the Pueblo specimens for tying on a cornhusk bundle. It may well be an intermediate form or even a style introduced by Pueblo refugees.

Other Artifacts

Another painted wood object that appears in the Palluche Canyon materials is a spool-shaped artifact (Figure 5). Four of these are known. They average about 10 cm (4 in.) long and 4 cm (1¾ in.) in diameter and have a hole through the long dimensions. They are painted with geometric designs in black and red on a white ground. The shape, although hand-carved, is one that would be best produced on a lathe, thus suggesting European influence. They are commonly called holders, and it has been suggested that they held feathers, but we really do not know how they were used.

There are two eagle ulna whistles in the cache. Although the style is considered typically Plains today, a review of the archaeological literature reveals that bone whistles and flutes are earliest in California and the Southwest. A flute similar to these whistles appears among the Pueblos in Pueblo IV times, while the whistles do not appear on the Plains until after 1600 (Brugge 1994:142–143).

Two baskets were also in the cache. One is a small example of the typical Navajo and Hopi fruit-gathering basket. The other is a folded bark basket; its closest known counterpart is a berry basket known from the Yakama, the Kootenay, and the Flathead.1

This brief overview does not exhaust the list of ceremonial materials from the Dinétah. It is, however, a fair representation of the diversity of the artifacts and the apparent sources of inspiration of some.

CEREMONIAL ITEMS

A major difficulty in relating these collections to changes in Navajo culture is deriving accurate dates. It is generally assumed that the greatest Navajo population density in the Dinétah correlates with the most visible and complex archaeological remains, namely, the pueblitos. The majority of Dinétah pueblitos have produced tree-rings between about 1715 and 1753, with a few, apparently minor, exceptions. A great many habitation sites, however, have no direct association with pueblitos, and relatively few have been dated. We know
that hogans were built and occupied long before pueblitos were known. We really do not know how far back in time hogans extend in the Dinétah, nor have we any clear idea of their numbers. On the other end of the sequence, the tree-ring dates seem to indicate that the dense occupation ended just when the Spanish accounts say it did, in the very late 1740s and early 1750s. A scattering of later dates and archival reports confirm a continuing but greatly reduced Navajo presence, one that by the late nineteenth century consisted largely of transitory occupation of hunters and gatherers and Navajo religious practitioners, except along the area's western fringes.

Few caches contain enough material for more than a very superficial estimate of dates. The Palluche Canyon collections are a notable exception. Both in numbers of artifacts and richness of types, they suggest a cultural trajectory reaching a peak of sorts and an almost cosmopolitan willingness to experiment with new ideas from outside sources. Tradition and historical documentation indicate that this acceptance of innovation may have been more a sign of stress, even desperation, rather than mere fascination with novelty. According to Harry Walters (Brugge 1994:Appendix B), there is a tradition of elaboration for Nightway that was seen as the cause of drought and disease. It was only when the excesses were eliminated and Nightway again performed in its original way that these disasters were overcome. Tree-ring records confirm the drought, and Spanish accounts add the pressures of heavy raiding by the Ute and Comanche.
The Palluche Canyon cache suggests this elaboration. The Christian influence evident in certain of the objects might well derive from the documented missionary activity among the Navajo in the 1740s. Some Navajo taboos suggest a rejection of certain Puebloan ways that appear to take place in the archaeological record about the middle of the eighteenth century (Brugge 1963, 1972).

Additional evidence for dating the cache materials is found in comparisons with the rock art of the Dinétah, sandpaintings, and present-day practices. One especially interesting example is that of basketry crowns, which are rare in the rock art, abundant in the caches and sandpaintings, and still in use today. The elaborate rainbows on Gánaskidi humps are usual in the rock art, well represented in the caches, but absent both in sandpaintings and present-day usage, where the rainbow is reduced to painting on the outer edge of the hump. Rod-frame headdress styles are prominent in the rock art and the caches, somewhat less so in sandpaintings, and survive in altered and limited ways today.

One additional sidelight with relation to two artifact types, the trailing headdress and the eagle ulna whistle, is the possible role of Apachean peoples in the diffusion of traits to more northern tribes. Puebloan and Hispanic traits have spread over a wide area, but the Apachean role in this process has received little attention.

The potential for caches to shed light on Navajo culture history has only begun to be realized. It is essential, however, that caches be recovered under controlled conditions and well documented, and that the materials given the best of curatorial care if the evidence they might provide is to contribute as fully as possible to our knowledge of the past.

ACKNOWLEDGEMENTS

Those to whom I am most indebted for help in this research are Polly Schaafsma, Hugh Rogers, Harry Walters, Caroline Olin, Alan Ferg, and Jan Bell. A more complete list of those deserving my gratitude is set forth in Brugge (1994). Thanks are also due Lauren Rimbert for typing this article. To all I say “ahéhee.”

—Albuquerque

ENDNOTE

1 The Navajo basket is made of cottonwood bark, resulting in a very clumsy container. The specimens in the Yakama Tribal Museum are of western red cedar bark, and those in the Kootenay-Flathead Museum are of birch bark, both of which allow a very neatly fashioned artifact. The Navajo basket may have been intended for use in a comic skit that is performed in the Dark Circle of Branches and might thus have been purposefully made unwieldy. For illustrations and description of the Yakama style, see Schlick (1994:115-131).
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Charcoal drawing by Bill Turney
ROY A. STAMM: *FOR ME, THE SUN*

James S. Carson

Albuquerque in the 1880s and 1890s was a young, growing Southwestern town, and Roy A. Stamm was growing up, also. Born in 1875 in Kansas, Roy came to Albuquerque in 1882 at the age of seven with his family. His father, Martin P. Stamm, started a wholesale fruit and produce business on south First Street by the railroad depot. As Roy grew up with the town, he became one of the movers and shakers of New Town Albuquerque. After graduating from the University of New Mexico in 1898, he was a newspaper distributor and a commissary manager for a railroad-grading project. He also worked in and eventually took over the family wholesale fruit and produce business. During World War I he tried potato farming in the Zuni Mountains; during World War II he worked as a safety engineer at Port Hueneme in California. He was a foreman during the construction of El Vado Dam. Marriage to Elizabeth Baldridge, daughter of prominent lumber dealer J. C. Baldridge, resulted in three sons, all still living in New Mexico. An avid outdoorsman, Roy opened a sports center in downtown Albuquerque in the late 1930s and led many hunting and fishing excursions (Figure 1). In the 1940s and 1950s he wrote many articles for *New Mexico Magazine* and eventually wrote a 500-page autobiography, *For Me, the Sun* (Stamm n.d.) of life and events in Albuquerque during the previous 75 years. This paper is a sampling of incidents from that autobiography.

**THE FIRST DECADE:**
1880-1889

Our family bible records my birth in Janesville, Greenwood County, Kansas, December 11, 1875, the first child. Naturally, on a lonely stock farm, that early childhood was not enlivened by any but adult contacts, except, possibly, by a “girl-of-all-work,” usually matured. I grew up largely able to amuse and take care of myself. The years have but little altered that characteristic, content with solitude—in my book, one is in a sad state if he is unable to get along with himself!

Mother, who taught school “down West Creek a few miles,” rode there and back on a spirited pony. She “packed” a five shot, Smith & Wesson .38 revolver which I have yet and occasionally carry. With its three inch barrel and light weight it is a wicked little pocket gun. Double action, with piston ejector, this still looks surprisingly modern. Mother was a good shot and had this for emergencies. Though she and my infant brother, Ralph Edward who died in Albuquerque the spring of our arrival, and I
left Kansas early in 1882, your narrator can still remember this farm and incidents which happened there so far back as "before he was three years old!" (pg. 16).

In 1874, both from Michigan, father, with mother, went to Kansas to raise cattle and blooded hogs. Later, in 1880, drought came, his cattle losses were heavy, and the hog cholera hit his breeding stock. Then, no standard treatments were known. Hogs purchased for hundreds of dollars each sank down and died while many of his range cattle grew too weak to move and starved.

Fed up, he sold everything, bought a carload of country butter, and started west on the Santa Fe, then building west in 1881. Reaching Albuquerque, the last sizable town before rails-end, he sold his butter to advantage and immediately went into the wholesale fruits and produce business. In 1882, he had a brick home built on South Second, then sent for mother and sons.

New Albuquerque was started in 1880 when the railroad came. Its growth was gradual and in 1882 I stumbled over irrigation ridges and corn stalk stubs still in evidence on the vacant lots. About 1883, the brick, three-story San Felipe Hotel was built on the corner of Fifth and Gold.

The year mother and I arrived from Kansas, 1882, a man named Yarberry was hanged in Old Town for murder—formal, engraved invitations were sent for the hanging—but the town was relatively orderly. Wild shooting was not uncommon by liquored and joyous visitors but these gave up their guns when requested by "the law." Several times, un-aimed bullets sang over my head along South Second. One of those wild ones tore through the thin wooden wall of a two-story store on First Street one block east of our home, to badly wound a woman sleeping in her bed on the upper floor.

In your own office or place of business it was all right to have a gun concealed on your person or premises, but if this be carried while on the street it must be worn openly and given to the bartender in the first saloon you entered—there were plenty of them!

Your writer feels this obedience to law and order mainly stemmed from two things: our town started with a clean slate and its livelihood depended greatly on the Santa Fe Railway. With neither mining nor stock raising nearby, no long smoldering feuds, no fights for mineral or water rights, no
factional struggles for control of grazing lands—all those usual troubles of western frontier towns were absent.

The railroad and the merchants were all for business and both were in the saddle, side by side. A definite procedure was established so the town could keep a firm grip on upstart lawlessness. Tough characters drifting into Albuquerque were promptly spotted and quietly disarmed. Afar from their usual haunts and without an appreciative audience, these saw no point in objecting to the low-voiced request: “Better give me your guns, boys, we’ll keep them for you till you are ready to leave town, that’s the law here.” This ruling became rather general in all towns well controlled (pg. 8).

The town ditch, a continual pest to my parents, was a god-send to a lonely and imaginative boy still only halfway to his teens—it ran right through our backyard! Father had it covered but it was open above our yard toward the town and also below clear down to the receiving river.

Always, it contained turtles, spotted frogs, and water snakes. Coming up from the river floods in the spring through the outlet, muskrats were plentiful, and once I saw a beaver. In the high banks, forts and shallow caves could be dug, and also it furnished make-believe mountains to balance the forests of sunflowers and weeds growing in the now dry swales below its western side. When not on my horse, I spent many of my childhood hours playing and dreaming along its banks.

In [Albuquerque’s] northern part, close to the railroad, was a half-pond, half-swamp, full of tules and cattails, into which two or three main ditches emptied. Ducks were shot there all through the season. That ditch through town and our backyard was the outlet for the surplus water. Fairly deep and wide, it went down the middle of Albuquerque but was heavily planked over [at] the streets and covered by the buildings in the main part of town. Bridges were built to cross it on streets in the residential section. In the spring and early summer, a good stream of muddy water flowed through, yet in late summer, fall, and winter it became an open sewer beyond the business district but, with trap doors in their floors, a convenience to meat markets, livery stables, restaurants, and Chinese laundries under which it ran! (pg. 10).

Three days ago, a heavy rain had fallen; South Second Street, usually ankle deep in fine dust churned up from the wobbles and lurches of iron-tired, axle-worn wheels, now was covered with fast drying puddles and rutted mud. Those shrinking pools were alive with tiny toads hatched by the water and the warmth of the spring sun.

In 1882, only in front of a few scattered houses were the occasional board walks made of 2X6s widely spaced by the thrifty and to let dirt and gravel fall through the cracks. This setup saved no money for the children with a nickel or a dime in their fists—those wide slits were stark tragedy to them!

It was always a nickel or a dime since pennies had no circulation in our town until years later. In every cash transaction we used “give or take” one or two cents where the price was not divisible by five.

When a Raymond and Whitcomb excursion train to the Coast arrived, we townsmen stood at our doors and windows to watch the “eastern tourists” pry off, for
souvenirs, small chunks of earth from the corners of adobe buildings. Contemptuously, we called them “penny people”! Always they were astonished when we refused the one or two cents still due us on the price but were downright resentful when we asked for five cents instead of the three or four actually due.

A small but sturdy youngster of six, clothed in plaid kilts, a cloth hat, and a Windsor tie (he wore this “artist type tie” well into his twenties) carefully picked his way between the puddles. Seated on the edge of a boardwalk was a much older boy whose curiosity was stirred by the glass-stoppered bottle carried by that small fry. Thinking it perfume, he snatched the bottle, pulled the stopper, took a deep sniff and nearly strangled! Diluted ammonia from the drugstore, it was for my father’s daily shampoo! Getting back his breath, with a wild “gringo, cabron,” he pounced on me as I stooped to retrieve the bottle gurgling its contents out on the ground, threw me into a puddle, and crushed a little toad against my tightly closed teeth. Frightened by my yells, he took to his heels and I to my mother!

She was of Puritan Massachusetts and Mohawk Valley Dutch ancestry and had taught school in Kansas. Outraged by this episode, she saw that from that time on I rode my saddle horse during most of my childhood (I became so accustomed to this, I’d ride across the street instead of walking! (pg. 1).

In 1885, placing me in a grade school conducted by a Mrs. Collins, gave me contacts I had lacked though never had missed. Well grounded by mother’s early lessons at home and on the farm, I soon outgrew the primary instruction of the Collins school (pg. 17). After leaving the primary school, I attended a paid tuition, sectarian institution which attempted to teach all grades above the lowest ones. This under-financed, indifferently manned school lasted two or three years and then faded away. Housed in a long, two-story, former lodging house, its upper floor rooms were rented by out-of-town students (pg. 19).

All through the “eighties,” Albuquerque still remained a small town. Even at the start of its next decade, 1890, Old Town and New Town, together, had a population of only 5,518, with almost a third of this in Old Town whose residents, practically all New Mexican natives, still clung to their Mexican customs, traditions, and way of life. These conceded nothing to the “discourteous newcomers in new town: loud voiced, money mad, so restless they have neither leisure nor appreciation of the things life grants to those who value them.” Many yet lived in the houses of their forefathers built on three sides of the plaza, with the church and convents occupying the north side. On religious holidays, evergreen booths under the portals in front of these dwellings contained small altars to be blessed by the padres as the procession stopped in its slow progress around the plaza (pg. 20).

As in all frontier towns, our most active and obvious citizens in early Albuquerque were saloon men, gamblers, and “ladies of leisure.” By common consent, these last kept open house around Copper Avenue in the northern part of town. In the next decade, the western end of this avenue became the best residential section.

Established “madams” and their business had a quite definite place in Albuquerque. Their contributions to our annual New Mexico Territorial fair equaled those of our
banks and you should have seen them in full bloom sitting in the boxes along the front of our grandstand!

To emphasize that effect, the alternate boxes contained the dignitaries and successful of our territory from generals and governors down; also, the exalted ladies of our young and ambitious local society; and, in this particular circumstance, all were placed on [the same] level in station and prominence. Only a slight exuberance of manner and dress distinguished those wayward goats from the docile sheep. On second thought, there was a more marked distinction, no men, no women went calling back and forth between those boxes! You have heard about western democracy, there it was in our most colorful forms.

Some years later we grew more civilized, or hypocritical, and banished our "filles de joies" to the nether regions of booths behind the long bar beneath the grandstand. Every booth had a 30 inch square window looking out onto the race track at the finish line. As each race ended those windows would suddenly blossom out with enameled faces beneath the gay colors of plumed hats, a surprise startling enough to frighten horses through the opposite rail, were those not so intent on winning!

Three houses of prostitution then dominated the situation in Albuquerque: Lizzie McGrath’s, whose trade had more of the lower incomes; Nellie Driscoll’s with customers from low, middle, and higher brackets; and Minnie Carroll’s, a local product who enjoyed a business from those seeking “the best.” To advertise their “merchandise,” all three separately would drive around town with one or more of their newly arrived “girls” (pg. 26).

Albuquerque’s first mayor, George Lail, a saloon keeper, was elected, literally, on a platform of free beer. He campaigned with four brewery horses pulling a large platform wagon loaded with kegs of beer [which was] dispensed to all who came by four bartenders, one at each corner of the platform! Next election, the merchants put in a Jewish merchant, Henry Jaffa, a man who had the respect of all Albuquerque.

This first instance of free beer in the town was surpassed a few years later when a local brewery was established and St. Louis and Kansas City breweries started a price war to put it out of business. The regular price of 15 cents per mug dropped to 2 for $.25, then 10 cents, followed by 5 cents, 2 for a nickel, and for three days free beer to all who wanted it.

[In those days] store entrances were recessed to give extra show windows and gate entrances to homes received the same treatment [thought to be] “more artistic.” These [entries] caught papers, leaves, etc., whenever a wind came up, which often happens in the Southwest, before, during and after the spring months. Also, these were temporary refuges for drunks who wanted to sleep but not in the street or on the sidewalk.

For over a week the beer war lasted and each morning and evening many a storekeeper and more householders had to clear out their entrances before they could open their doors or gates! Countrymen streamed into town [for] days after the war ended (pg. 28).
THE SECOND DECADE:  
1890–1899

Now 14 and adolescent, widely I ranged the surrounding country for many miles. When not in school or in bed, my horse and I were inseparable. Meals seemed incidental; either I carried an ample lunch or ate heartily when home. The dreaming hours were gone; the questing, testing days had begun (pg. 32).

With a girl, occasionally I rode to the sand dunes across the river to spell out the given name of my current crush with damp sand pulled up on the always dry, breeze-blown surface by the deeply sunken hoofs of my horse. Even through my varsity years this trick never missed; those letters could be read from the town wherever the dune was in sight. No lass would scorn so public, so private, a display of affection. It was "so much more romantic, not common like initials on a tree!" Somehow, though, her friends always learned her secret (pg. 34).

Before me is an advertisement of the [Albuquerque] Academy. Printed in quite small type, in the lower left hand corner of the front page, this is in the October 17, 1883 issue of The Albuquerque Morning Journal. From this, we learn the Academy was established in 1879 at the corner of 5th and Silver, an L-shaped, three room brick building with a small belfry but no bell. In the Highlands, at 214 S. Edith, it had a two-room frame building. These two housed the beginnings of the Albuquerque Public School system. Though the Academy received tuition from those whose families could afford this, also it had "scholarships" for the children whose parents needed every dollar they earned.

Albuquerque Public Schools were authorized in 1891 and established in 1892. I spent my freshman and sophomore years at the Academy, the junior year at the Albuquerque High in the frame building in the Highlands and the senior year of my high school on the second floor of the brick library building which eventually was torn down to be replaced by the present pueblo type structure [Edith and Central]...Here I met Lewis Brooks and Seymour Lewinson both of whom graduated with me from the High School in 1893 while Brooks and I went on to do the same from the University in 1898 (Figure 2). Lewinson, a well-known merchant in Albuquerque, died a few years ago but Brooks is still living in Wisconsin (pg. 37).

At the age of nine I had fought my way out of kilts two years back but still wore knee pants. Here, my struggles were not yet successful until mother sent me to dancing school. I used this as a bargaining point to win my first long pants or trousers. Our dancing master, a Texan, Landrum by name, was good enough eventually to become president of the American Dancing Masters Association. His music was a piano played by a Swedish nobleman whose name I have forgotten and an unusually fine violinist, Professor Di Mauro, a political refugee from Italy. He was a close friend of Puccini who wrote his "La Boheme" in Albuquerque while here on an extended visit with Di Mauro. Such men were not unusual in the West in those earlier days. The reasons for this were various but often quite obvious!

Landrum liked Albuquerque and remained for three or four years before going on to larger fields. A real teacher, he brooked no nonsense; the polka, waltz, schottische, lancers, and quadrille were the
principal dances on programs and we really learned these correctly. His set-up seemed unusually good for a town no larger than Albuquerque.

French tenor Du Puys gave me vocal lessons but when he insisted I stop bicycling because this roughened my tone, I stopped voice instruction. A few mandolin lessons were given me, but I soon decided I was not in harmony with my fellow students so that too, fell by the wayside. Truth was, I liked music but had neither urge nor aptitude for making it (pg. 45).

By 1890, displacing the high wheel-low wheel bicycle in previous use, the low, two equal wheeled, pneumatic tired bicycle became increasingly popular. When I was given one of those "safeties" as these were called, I lost some interest in my horse (pg. 50).

Most of my riding and driving [of horses and buggies] was in the valley while I bicycled largely on the mesa east of town. Valley roads too often were likely to be muddy from overflowing irrigation ditches while the mesa roads were at least dry even though sands, ruts, and stones made some stretches rough going. Even on these, a strong bicyclist could make his "century" one hundred miles in one day without too much trouble. One favored trip was southeast over the mesa to Largo Canyon, northeast up this and over the divide into
Cedro Canyon, down from there to the northwest into Tijeras Canyon and west down to its entrance; and then straight west over the mesa back to Albuquerque.

Hardy souls would ride to Santa Fe and back within a time limit of twenty-four hours. On long trips I could hold my own with the best, and in short races I was not so bad when I finished second in an amateur mile race at the Fair Grounds with thirteen entries. That was the only race I ever entered and I decided it was too specialized and demanded more hours than I wished to spend on bicycling (pg. 63).

Before I graduated from high school, Congressman H. B. Fergusson, father of authors Harvey and Erna Fergusson, personally asked me to accept an appointment to Annapolis. He had held two competitive examinations; the winner of the first failed scholastically and the second winner could not pass the physical. He felt New Mexico was dishonored and urged me to accept but even then I disliked regimentation, I did not wish to know what I would be doing at a date four to six years ahead.

An opportunity greatly prized by many youngsters and their parents, it made no appeal to me. Through his business and real estate investments, father was wealthy and we had planned four years at Harvard and a three-year law course to fit me for my prospective inheritance; also, I liked New Mexico! (pg. 55).

After I graduated from the high school, on May 26, 1893, father took his family on an extended trip to Kansas, Chicago’s World’s Fair, and Michigan (pg. 71). [While in] Chicago father was astonished to learn that the two banks in Albuquerque, in both of which he was a depositor, director, stockholder, and heavy borrower, had closed! Both banks were sound, he knew that, but we returned to Albuquerque at once. He found the town still dazed. The panic of 1893 had begun, rumors and runs started so those two banks closed to protect their depositors as a whole since they were unable to get immediate cash to pay all depositors (pg. 72).

Those carefree days were gone; “the whole Stamm family” now had problems. Yet seventeen, having just graduated from high school that spring, I decided I would work for father for awhile and at the same time take private tutoring in Spanish and mathematics. Since my grade school days, I had helped out when needed so wholesale fruits and produce were nothing new (pg. 75).

Those bank failures and the general panic of 1893 altered plans which [my friends] Lewinson, Brooks, and I had made, so the three of us decided to attend the local University of New Mexico in the fall of 1894. Lewinson dropped out after the first year but Brooks and I carried on to graduate in 1898. Brooks was interested in business and mining courses, while I took a lot of languages, ancient and modern, and literature. Living at home, it was neither an aimless nor an expensive life but all through it I felt after graduation from the Varsity I must strike out for myself. Father was having a hard struggle and could not afford to keep a job for me or to send me East though he was hurt every time I hinted this. Proud, he wouldn’t even discuss it with me (pg. 84).
All through high school and university I had helped out [at father's business] after school and vacations. After graduating from the university for a few months I made father a steady employee in his business. This was all for which I had been trained and I knew my apples. Nevertheless, it was evident father was now keeping me when he really didn’t need me. Determined to send me East for a degree, he was humiliated when he could not. Had there been a line I wished to follow I would have worked my way through those extra two years of college but I liked New Mexico and the wholesale fruits and produce business, one that is almost a profession demanding plenty of capital which now we did not have. With ordinary patience and application, I could have gotten a job in a store, an office or a bank, but I disliked inside work and asking anybody for anything at any time (and do yet) (pg. 110).

Later in February, 1899, father called me down to the telephone one morning, though still half asleep. Next morning at five o’clock I was in a buckboard on my way north to Señorito Canyon in the Jemez Mountains and the Jura-Trias Copper Mining Company’s camp and post office at Señorito, then one hundred and seven miles north of Albuquerque by the post road. Four miles from Cuba, its nearest railroad point was distant Bernalillo. The camp employed about a hundred men who were mostly from around the country. I was storekeeper, bookkeeper, postmaster, weighmaster, supplyman, and anything else which was loose and not technical. At that, I had plenty of time on my hands. A young Mexican about eighteen years old was my assistant and the dining room and kitchen joined the store on the east. I slept in the store and my assistant, our woman cook, and her helper had quarters in a smaller building behind (pg. 113).

Next spring [1901], convinced the Jura-Trias had no future for me (nor for themselves, for that matter), I accepted a better job from the Albuquerque Journal Democrat to serve as outside man and travel in New Mexico and northern Arizona as a correspondent, advertising man, and subscription solicitor. In truth, what they wanted most from me was new subscriptions. After two or three months, I asked how my work compared with others who had the job before. George Albright, the managing editor, said I had landed more names on their subscription lists than any of them...A year later, Albright complained, “you get them on but, damn it, they don’t stick!” “That’s your fault,” I quickly answered and we dropped that subject (pg. 135).

[In those days] a small-town newspaper’s outside circulation depended largely upon its railroad schedules and how quickly it could reach its subscribers after going to press. That time-table determined how far out you could go before meeting the better time of rival newspapers. To the north, Santa Fe gave us good business but at Las Vegas we met Trinidad and Pueblo papers. In the west, we went so far as Williams, Arizona. Southward, at Silver City, Santa Rita, Ft. Bayard, Pinos Altos, Hanover and Deming we were a half day later than El Paso. Below Rincon, we did little. Everywhere you found Denver and Los Angeles papers coming later but larger, more detailed, and more sensational than the local papers. Our advantages, of course, lay in our earlier arrival with general news.
and our better coverage of territorial happenings (pg. 138).

While this two years' experience as an outside newspaper man was not exciting, certainly it was educational and well worth while to a young man. Not only did I visit a goodly portion of New Mexico and northern Arizona but also I absorbed a knowledge of catch-as-catch-can human nature in various guises and places (pg. 141).

Early in 1902, a better offer from the Santa Fe Central Railway then under construction through the length of the Estancia Valley brought me other duties and contacts far more interesting as well as enlightening. The 100 mile stretch between Kennedy on the Santa Fe in the north and Torrance on the Rock Island to the South was one of the easiest railroads to construct as one could imagine. All wooden bridge piles were driven first and the grades "Fresnoed" up to them; there was some cut-and-fill work but little stone to blast anywhere; practically the whole grade could be built with four-mule Fresnos. These are wide, deep but narrow scrapers pulled by four animals abreast and were then universally used to move light soils which are easily scraped. Most of this work was done by a contractor named Mulligan; his "Mulligan's Mules" were famous all over the Southwest.

The bridge-gang was going to the south and to top each bridge with stringers, etc., as they worked north. This done, ties and steel could be laid after the grade settled and seasoned sufficiently. An off-shoot into Albuquerque around the north Sandia was part of the project but only graded a bit and never completed. They did finish the Santa Fe Central and it was operated until a few years ago when the steel was removed and the line abandoned.

The whole project was unsound, under financed and purely political in its conception. It was said the "Pennsylvania Gang" fathered it. Banks were stuck and at least two suicides resulted. "Bull" Andrews, a former henchman of Matt Quay, senator from Pennsylvania, took credit for its promotion and, on the strength of this, it was again said, persuaded, bought, and bribed a Republican convention from under Bernard Rodey to succeed him in Congress. Since Rodey was my brother's father-in-law I have heard all about this (pg. 145).

[In late 1903] I received a letter from father saying he and his competitor, D. A. Bittner, wanted to see me in Albuquerque. Father said Bittner's proposition depended on my coming to work for them. [By this time] father's slowly increasing resources gave his business added capital; Bittner realized he would lose a lot of father's business he now had. In poor health, Bittner could handle only the office but wanted the two of us to do the buying and selling. We knew an equal partnership of Bittner and Stamm would make money so I agreed (pg. 177).

Now a member of the company both my income and prestige increased. Any able, active man in business or professional life is eagerly welcomed by civic leaders provided he will work; young men almost are compelled to this when those others do....Father was well known as a city booster liberal with his time and money. Naturally, I trailed along (pg. 182).

Early in 1907 I was picked for secretary of our 27th Annual Territorial Fair. This was an honor for any young businessman,
since the salary, $400, was only nominal and anyone capable of filling that position with credit could not afford [to do this job] for ten times that sum. Raising money for this fair alone would take weeks of his time and only men successful in their own businesses could afford this distinction (pg. 184). We had a large attendance, good weather, and a successful Fair, but closed with a nominal deficit of about $1,500 (pg. 191).

The spring of my Fair year, 1907, father left the Bittner-Stamm Fruit Co. and divided his [business] interest between Raymond and me. He and mother went to the Coast for a year. Bittner did not like this but made no protest. Since with his more profitable real estate operations Father gave little time to the partnership and Bittner only looked after the books, it actually made no difference to the business; I was both buyer and seller and we were making good money every year (pg. 200).

In 1909 Bittner died, and to fill the void we took on a silent partner, Felix Lester, an ex-mayor of Albuquerque. [Our] business served a civic need. Car-lot buyers and distributors of usually highly perishable fruits and produce, we enabled the retailer to buy from us for less and in better condition than he could ship it in by express or by local freight. Our fortunes were tied closely to the railroads since the difference in freight rates between carloads and smaller shipments included our profit margins. Also in car-lots we bought more cheaply and where necessary these reached us under refrigeration.

From 1881 to 1931, exactly fifty years, from father to son the Stamm name (Figure 3) was dominant either alone or with others in the fruit and produce business of Albuquerque (pg. 199).
A man of the West, I do not care for the tropics except on the high-slope savannas of their mountains and volcanos. The vegetation comes right down to the white surf of the beach, almost continual clouds clothe the mountaintops with an occasional peak thrusting up here and there. Even the sides of the railroad cuts and the space between the ties of the roadbed are green with growth. Only the beds of torrents show bare boulders and stones; these testify to the torrential scour and power of overflowed streams. Always the morning air is soft with no bite, no substance. The whole scene is enervating; humid and heavy to breathe and oppressive with its surge of green. "For me, the sun!" [New Mexico] (pg. 228).

The year following our captive balloon stunt at the "Territorial Fair" [1909], it became evident the airplane soon would be an attraction available to smaller cities. The New Mexico Fair Association in 1910 attempted to show one in Albuquerque. In those days, of course, both engine power and aerodynamic knowledge were woefully weak. This plane, brought in by express, proved unable even to leave the ground at our mile-high altitude.

Next year in 1911 Charles F. Walsh, a pupil of daredevil Lincoln Beachey, contracted and made three flights of fifteen minutes each. For these, we were informed, he received $4,500, which is $100 per
minute! Those days, aviators lived on borrowed time and were paid accordingly.

The plane, a Curtis biplane, single propeller, pushbar type, used an elevator out in front (Figure 4). Its “passenger seat,” a board 12 inches wide and 24 inches long, was wired onto the lower plane just off center to the left of the elevator. On the other end, to equalize the weight, a small anvil and assorted tools were hung.

Monday morning, Joe McCanna first, then I went up for somewhat longer trips. Sitting on that little board, feet dangling, one hand gripping a strut and the other a reversed cap [on my head], with nose splitting the air just behind two crossed-wire braces, my strongest impression was: “If we snub when landing I wonder into how many pieces those wires will cut me!” (pg. 232).

In 1913, Felix Lester died and I needed another partner since [his widow was not interested]. Raymond [had] accepted a position with the International Harvester Company at Denver (pg. 240).

My new partner, Harry Benjamin, was the next oldest of those four Jewish Benjamin brothers, all strongly built and now all gone: Sol, the oldest, was a sprinter; Harry, a football tackle; Louis, the best looker; though all brothers had enough, was the ladies man; and Charley, a good amateur boxer and a fine boy.

In my opinion, Harry Benjamin had more friends in Albuquerque than any other man. Jewish, married to a Spanish girl of the Armijo family by a Protestant minister, with his closest friends Gentiles and his children reared as Catholics, everyone liked him. He could have made a successful politician but wanted nothing to do with public office (pg. 241).

The first World War started in 1914; our U.S. Food Administration was established August 10 after we entered, April 6, 1917, and as head of the only exclusively wholesale fruit and produce business in the state, I was placed in charge of the perishables department for New Mexico. This seemed merely an occasional desk job and I wanted something more constructive.

February 1918, at a meeting of several civic leaders in the office of Paul Reddington, chief of the U.S. Cibola Forest District, I learned the Government had thrown open to lease and cultivation all Forest lands suitable for food production. I went out to the Zuni Mountains to inspect and lease cut-over lands offered to the public for the same reason by the McGaffey Lumber Company.

That Zuni plateau shows beautiful, open parks among the timbered hills, with an average elevation of a bit below 8,000 feet. There streams are few and far apart. Surrounded by arid uplands, the summers are rather dry while winters often bring heavy snows (pg. 248).

The main body [of our land] lay where four parks came together from the north, northeast, southeast, and south. Because of this four-leafed clover configuration, we named it the “Lucky Leaf Ranch.”

Our contract with the McGaffey Company bound them to furnish us with a railroad siding for carlot loading, to haul our cars to Perea station on the Santa Fe and to fence in all the land we leased. We were to do a certain amount of development work on these lands, pay a nominal rent, and
eventually to either close the option we received to buy this land or to turn it back to the company with all improvements we might make.

Primarily we went up there to grow potatoes since these were produced in New Mexico in limited quantities and only in the mountain valleys. Our lower lands seemed too dry-aired to produce potatoes profitably even under the irrigation methods then practiced. We could aid the Government, the railroads, and ourselves by growing potatoes for our local markets instead of shipping in these from Colorado or California.

The dull months in our business were February, March, and April, and August, September, and October. These coincided with the active months of plowing, planting, and harvesting in the Zunis and I was able to spend a large part of my time then on the Ranch with no appreciable loss to our Albuquerque business (pg. 250).

Out there, Mrs. Stamm spent four summers of the five I more or less passed at the ranch and we never lacked entertainment. In a grove of young pines on the brow of the hill overlooking the whole home ranch, our tent was pitched at least a hundred yards above the ranch buildings [which were] on the terrace at its foot. With a canvas fly and board floor and sides,
CONCLUSION

The preceding is just a taste of Roy Stamm's first 45 years. The biography is rich in Albuquerque and New Mexico history from someone who was there. He discusses events from 1880 until just before his death in 1957 at age 81. His three sons are still living in New Mexico: Alan, the oldest, in Santa Fe; Bill and Bob in Albuquerque. Roy attempted to have his book published before he died, but publishers were hesitant because of the limited audience at that time, and the personal nature of some incidents; many of those named were still living in Albuquerque. Now, 40 years later, the curtain can be raised. It is my objective to have this delightful autobiography published so that another piece of Albuquerque’s rich history can be available for all to read and enjoy.

ACKNOWLEDGEMENT

I want to thank William Stamm for giving me this wonderful autobiography to work with and for providing additional background information on Roy Stamm, his father.

—Albuquerque

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Charcoal drawing by Bill Turney.
THE THIRD PITHOUSE AT THE NIGHTHAWK SITE (LA 5685)

Carol J. Condie

In 1994, Quivira Research Center excavated a partially semisubterranean and partially surface, burned pithouse, occupied in the late A.D. 800s. The pithouse was the last of three pithouses to be excavated at Site LA 5685, the Nighthawk Site, and may have been inhabited (or at least abandoned) a little earlier than the other two, since the ceramic inventory lacks the post-A.D. 900 intrusives present at the other two structures. Evidence for trade with the Mogollon and Cibola districts is completely absent, but inchoate fossil Unionid clam shell beads indicate trade with or actual visits to the Canadian drainage or the Pecos drainage below Roswell. Two of the three hearths were constructed after abandonment and contained hastily gathered fuel. The pithouse fill represents a model of churned stratigraphy.

INTRODUCTION

The Nighthawk Site is on the left bank of the Rio Grande north of Albuquerque, on Sandia Pueblo land, in Sandoval County, New Mexico. The third and last pithouse at LA 5685 was excavated by Quivira Research Center (QRC) in 1994. The first two pithouses were excavated by James V. Sciscenti in 1960 and 1961 (Figure 1). Prior to this current project, QRC conducted additional tests at the site in 1981, analyzed Sciscenti's artifacts, and incorporated information from his field notes in our report (Condie 1982). (A short version was published as Condie 1987.) The third pithouse, reported here, lies on a narrow, sloping finger projecting down from the first left-bank terrace above the Rio Grande.

ARCHITECTURE AND INTERIOR FEATURES

Pithouse 3 is roughly square with rounded corners (Figure 2) and measures 5.2 to 6.0 m in diameter. The pit was excavated approximately 70 cm below then-existing upslope grade (110 cm below present grade) and terminates in a floor that varies from a constant level by only a few centimeters. Except for a spotty area around the central hearth, there is no evidence of floor plaster.

Interior features consist of three hearths, four post holes, a set of ladder sockets, a second set of pits that may be old ladder sockets, and two small pits of unknown function. Two large, flattish stones were located lying on clean eolian fill in the western sector of the house, and a large flat stone was located next to a concentration of sherds in the ash of the central hearth.
Figure 1. Pithouses 1, 2, and 3, Nighthawk Site (LA 5685), Sandia Pueblo, Sandoval County, New Mexico.
Figure 2. Pithouse 3, Nighthawk Site (LA 5685).
Neither a ventilator nor a deflector is apparent.

The current slope of the small tongue on which the pithouse is located raised the startling possibility that the house was only partially subterranean. If the slope was 25 degrees, as it is today, excavation would have started at grade on the southeast edge and moved northwest into the slope. If this occurred, it seemed logical that a constructed segment would have been required to form the southeast wall arc, for which we found no evidence. The question was answered in the southwest area, where the present top of the wall is only 28 cm above floor level. Resting on the top of the wall was a short section of charred log, which demonstrates the level of the exterior grade at the time the house burned and also demonstrates conclusively that the slope had not eroded appreciably since abandonment. It appears, then, that the builders merely used longer poles as leaners in the southeast section of the house and were unconcerned that the house was both a surface and semisubterranean dwelling.

Standard Basketmaker-style roof construction is reflected in the four post holes and the charred, collapsed hatchway, beams, leaner poles, and thatching. Most of the mud plaster had apparently melted and washed away by the time the house burned, for we found so few fragments of burned mud in the fill that for a time we questioned whether the roof had ever been plastered. One of the fragments—a baked, pole-pressed chunk of mud to which was attached a portion of a mud-dauber's nest—provided a definitive answer when David Thompson, who identified our entomological specimens, informed us that mud-dauber nests never burrow into the ground but always build their nests aboveground.

The mud-dauber could not have burrowed in and attached its nest to the chunk of baked mud after the house had burned and collapsed—the nest had to be constructed while the roof was intact.

HEARTHFS

Hearth 1 (Figure 2), the central hearth, is oval and measures 26 cm north-south by 38 cm east-west. The hearth was simply scooped a few centimeters into the floor, and a low collar was formed irregularly around it. A slight depression just northwest of the hearth may be a pot rest. The collar and hearth floor had been plastered in a desultory way with a coating of coarse, crumbly, clayey soil, now burned orange. There is no ash pit. The hearth was overflowing with fine gray ash that reached a horizontal extent of 112 by 143 cm and a depth of 18 cm. A group of several large sherds and numerous small sherds lay near the top of the ash. A few items of lithic debitage and large amounts of fire-cracked rock were mixed in the ash. A large (20 by 15 by 4 cm) quartzite slab rested next to the large sherds. Two or three other, uncracked quartzite cobbles lay near the hearth.

Hearth 2 (Figure 2), in plan between a pear shape and an oval, measures 60 cm east-west by 35 cm wide at the west end and 24 cm wide at the east end. It was excavated 17 cm into the floor. Six large, smoke-blackened quartzite cobbles rested in the tree-bark charcoal. Of the charcoal, Glenna Dean, who identified the macrobotanicals, remarks:

'The unidentified bark submitted from the Unit C-0 hearth [Hearth 2] could have formed the major fuel source or have been used as tinder, but the
absence of more substantial wood charcoal similarly suggests that more suitable fuelwood was not readily available. [Condie et al. 1996]

In addition to the oddity of its fuel is the oddity of the location of this hearth—only about 22 cm inside the wall. This hearth could have been blamed for causing the roof fire, had there not been several centimeters of clean fill above the hearth and below the charred roof members. Hearth 2 was clearly not responsible for igniting the structure.

Hearth 3 (Figure 2) measures 50 cm east-west by 70 cm north-south and was excavated 6 cm into the floor. Four burned quartzite cobbles (each approximately 12 by 6 by 4 cm) lay in the charcoal. Again, the fuel was strange. Glenna Dean observes:

The saltbush and/or greasewood fragments [from Hearth 3] exhibit large fissures....These fissures are characteristic of woody material that has been burned while green. The presence of green brush in the...hearth suggests that the hearth was used during the growing season. However, green woody material does not burn well even as tinder, and suggests that little other combustible material was readily available when the...hearth was last used. [Condie et al. 1996]

Hearth 3, 80 cm from the wall/roof, is distant enough to escape blame for the fire. Further, it should be noted that, as with Hearth 2, several centimeters of clean fill intervened between the hearth and the burned roof.

**Post Holes, Ladder Sockets, and Other Pits**

Three of the four post holes (Figure 2) contained decayed fragments of unburned cottonwood posts in pits ranging in diameter from 20 to 30 cm and measuring about 60 cm deep. Post remnants, encountered at depths of 10 to 15 cm below floor level, measured 15 to 20 cm in diameter. The bottom of the fourth post hole, which had been invaded by rodents, terminated in a J shape, and the fill contained only charcoal chunks and charred reed—but no unburned wood.

A set of two pits (Figure 2) located 65 cm east of Hearth 1 (and about 25 cm east of the ash deposit) are unquestionably ladder sockets. They measure 11 cm in diameter and 24 cm and 26 cm deep, and they lie 40 cm apart (measured on center). Both are angled 65 degrees from horizontal, an angle that would result in the ladder's emerging from the house at the west edge of the hatch opening.

Another set of pits, separated by 45 cm (measured on center), may be old ladder sockets (Figure 2). Measured on center, these pits are 30 cm east of the hearth, but were completely covered by the ash deposit. The north pit measures 15 by 23 by 7 cm deep; the south pit measures 12 by 17 by 17 cm deep. Whether these measurements reflect the original excavations or resulted from abandonment and erosion is impossible to tell. They may not be old ladder sockets, but the southern pit seems too deep at 17 cm for a pot rest, and the location—essentially in the fire—would seem to rule out a deflector.

Two additional pits, separated by 30 cm (on center), are present in the pit house.
floor (Figure 2). The northern pit is 10 cm in diameter and 6.5 cm deep, and the southern pit is 10 cm deep. The pit walls are vertical. Their function is unknown.

**The Missing Deflector and Ventilator**

The ventilator shaft and deflector should have been in the eastern segment of the house, since the prevailing winds are from the west. Neither of the pairs of pits east of Hearth 1 seems to be a possible candidate for the deflector. The absence of a deflector suggests the absence of a ventilator. If the southeastern sector of the house floor was at or just below grade and if the thatching and roof plastering did not completely seal the structure at this point, the roof itself may have provided an adequate cold-air intake. Since the pole leaners and the thatch would break up any direct gusts of air, a deflector may not have been necessary.

**Character of the Fill**

The pithouse was excavated in 1-by-1-m grids by 10-cm levels. Level 1, 100 to 110 cm, was the lowest level and marked the floor, which occurred at 102 to 109 cm below present grade. Only the northwesternmost grid contained 11 levels. Because the terrain slopes down to the south and east and because of the unevenness of the modern surface, grids contained progressively fewer levels from northwest to southeast to the extreme low point, which contained only Level 1.

The entire fill consisted of fine, eolian sand, except for a few local spots of slightly gravelly soil where post-occupation rodent burrows had allowed outside soil to wash or drift in. Charcoal stains and fire-cracked rock were present on the surface of some grids, but most of the upper 10 cm consisted of unstained eolian sand. Staining, charred reeds, and chunks of charcoal became more frequent as excavation progressed, until the levels containing the burned roof fall were reached.

Pithouse 3 presents a fairly clear picture of the decay of a pithouse after regular maintenance ceased. Chunks of burned and unburned roof daub were present in the fill, but in quantities far too small to account for the entire roof. Much of the roof plaster seems to have melted and washed away before the house burned. Further, the roof was not entirely intact when it burned. Kent Stout, a project member and a registered architect, believes that the charred logs are too few to have composed the full roof. Another indication that portions of the roof were missing is that several of the charred logs were found lying at angles of 20 to 30 degrees from horizontal on drifts of clean fill that had formed directly on the floor—presumably from eolian sand sitting through gaps in the roof. Logs may have been scavenged from the roof or patches of the thatch may have blown away or disintegrated once the mud plaster was gone.

**SITE-FORMATION PROCESSES**

A few observations on site-formation processes may be appropriate here. Sherds and lithic artifacts were present in all levels, including the modern surface. Fire-cracked rock occurred on the surface, sporadically throughout the fill, and in great quantity in Hearth 1 (the central hearth) ash. In addition to the usual rodent and insect burrows, which are readily apparent, we found several live lizards that had reached respectable depths in the fill leaving no traces of burrows behind them. We also found several insect cases (at similar depths
and, like the lizards, leaving no sign of burrows) that were assessed by David Thompson, entomologist, to contain viable pupae or to be no older than one or two years. Also, the brass cup from a shotgun shell was found in Level 2 (90-100 cm level) at a depth of 60-70 cm below modern grade. Finally, in October 1992, during mapping for the testing phase of this project, we collected one-half of a calcite pendant from the surface. The pendant had not been present during previous visits to the site beginning in 1982 and had presumably been brought to the surface between a visit in 1987 and October 1992. The other half of the pendant was recovered from the 80-90 cm level (Level 3) during our 1994 excavations. These observations only substantiate our own and countless others’ observations over many years and duplicate the results of several experimental and analytical studies (e.g., to name a few, Bocek 1986, 1992; Erlandson 1984; Goldberg et al. 1993; Schiffer 1983; Wood and Johnson 1978). The trackless lizards and insects surprised us.

Namely, the picture that results from looking at the fill and surface of a small, discrete site like Pithouse 3 is that creatures of all descriptions apparently began enthusiastic burrowing almost immediately after abandonment (if not before), bringing artifacts, charcoal, and other items to the surface. As each new surface was formed through wind and water action, some cultural materials moved up, whether from the previous surface (perhaps only a centimeter or two below the new surface) or from the original surface. At the same time, other materials moved down, via burrows, cracks, erosion channels, etc. Add these actions to root action, frost heaving, upward migration of rocks, etc. (Buol et al. 1989) and it is not difficult to argue that only the heaviest objects can be assumed to be in situ.

**ARTIFACTS**

A total of 636 lithics and 668 sherds were collected and analyzed. Landon Smith analyzed the lithic artifacts, and Hayward Franklin analyzed the ceramics. Rick Smartt, Director, New Mexico Museum of Natural History, identified the shell.

**Lithics**

Pithouse 3 contained only 10 tools—a surprisingly small number for a habitation site. Only five complete and fragmentary projectile points, all obsidian, were recovered (Figure 3). One sandstone metate fragment and one quartzite pebble that may have been used for grinding red ochre were found (three small pieces of red ochre help confirm the use of the quartzite pebble). The remaining tools are one basalt uniface chopper, a chert biface fragment, and a possible basalt core tool. Except for a calcite pendant (see Jewelry section below), debitage constituted the remainder of the lithic artifacts.

The debitage was analyzed according to the method suggested by Sullivan and Rozen (1985), a cost-effective method that seems to work fairly well in allowing quick determinations of whether core reduction or tool manufacture, or both, occurred at a site. The surface and subsurface collections from Pithouse 3 present a slightly unusual pattern. Sullivan and Rozen (1985) state that high percentages of cores, debris, and complete flakes should be present if core reduction has occurred. At Pithouse 3, high percentages of complete flakes (47 percent from the surface versus 37 percent subsurface) are coupled with low percent-
Figure 3. Obsidian projectile points from Pithouse 3, Nighthawk Site (LA 5685) (all actual size).
ages of cores (1 percent from the surface versus 4 percent subsurface) and debris (23 percent from the surface versus 21 percent subsurface). Items retaining more than 10 percent cortex are fewer than those retaining less than 10 percent cortex—47 percent of surface artifacts, 32 percent of subsurface artifacts. Given the situation of this site amidst the bounties of the Rio Grande gravel tongues, it seems reasonable to conclude that the flint knapper(s) walked a few meters away from the site to any of the numerous nearby cobble exposures, struck a few flakes from a few cores, gathered up the most likely flakes, and returned to the pithouse with them, where a few were worked into tools and the rest were discarded.

**Ceramics**

The ceramics constitute a typical Basketmaker III-Pueblo I assemblage, consisting primarily of Lino Gray (89.4 percent), but also containing small amounts of Lino Fugitive Red, Lino Black-on-gray, Kana’á Neckbanded, and San Marcial Black-on-white. Vessel forms consist of jars, bowls, and seed jars. Four lug handles of Lino Gray and one of Lino Fugitive Red were recovered. Hayward Franklin, who analyzed the ceramics, compared the Pithouse 3 ceramics with those from the two structures reported in Condie (1982, 1987). He concluded that Pithouse 3 was constructed (or perhaps only abandoned) slightly earlier than the other two, his rationale being that Mogollon and Cibola trade wares present in these pithouses do not appear in the Pithouse 3 collection—a fact that suggests a time previous to establishment of ceramic trading relationships (Condie et al. 1996).

**Jewelry**

Jewelry consists of both halves of a calcite pendant and 10 Unionid shell beads in the process of manufacture (Figure 4). The fossil Unionid shell is from either the Canadian drainage or the Pecos drainage below Roswell (Rick Smartt, personal communication 1995). Two of the Unionid shell pieces show drill holes, and two edges of one of the drilled pieces have been smoothed and polished. Rick Smartt (personal communication 1995) noted that all of the Unionid shell has been broken into sizes appropriate for jewelry manufacture, none of them exhibiting the form in which it erodes out of the matrix.

Whether actual visits or trade was the means by which shell was obtained cannot be determined. Looking toward the Salinas District for possible contemporary trading partners is inconclusive, but there are a few hints. Fenenga (1956) excavated a pithouse site a few kilometers northwest of Gran Quivira that contained no shell but large amounts of Lino Gray in addition to Jornada Brown. Beckett (1981:48–50) believes that pithouses in the Gran Quivira area date between A.D. 400 and 1200, which information, coupled with Fenenga’s Lino Gray sherds, at least indicates that people with ties to the Anasazi area were present early enough to have transferred shell to the Albuquerque area in the A.D. 800s. Hayes and others (1981:163–164) recovered numerous Unio shell beads from Mound 7 at Gran Quivira (A.D. 1300s–1600s) and believe they were obtained as finished items. It may be that the Pithouse 3 shell reflects a Pueblo-Plains trading pattern that began in the 800s and lasted through the 1600s.
Figure 4. Jewelry from Pithouse 3, Nighthawk Site (LA 5685): (a) calcite pendant; (b, c, d) fossil Unionid shell beads in the process of manufacture. Shell is from the Canadian drainage or the Pecos drainage below Roswell. (All actual size.)
Food Bone

Sixteen fragments of long bone and one scapula fragment were recovered. All but one were from rodents of the size of rabbit or smaller. The exception was one long-bone fragment of small artiodactyl size. Four of the fragments were unburned; 12 were burned. None of the bone was worked, but nearly all of it was splintered, probably as part of typical cooking procedures. No patterning was apparent to suggest that eating was restricted to specific areas of the house.

CHRONOMETRIC DATING

A sample of charred reed (*Phragmites communis*) used as roof thatching was submitted to Beta Analytic for radiocarbon analysis. The sample yielded a conventional radiocarbon age of 1060 ± 60 B.P. cal A.D. 880-1050 and A.D. 1100-1110 (Beta-75535).

Two 10-cube samples were submitted to Dan Wolfman, Office of Archaeological Studies, Museum of New Mexico, for archaeomagnetic dating. Unfortunately, dates were not derivable from either sample.

SUMMARY AND INTERPRETATION

Pithouse 3 at the Nighthawk Site was apparently built and abandoned in the A.D. 800s, to judge from the ceramic evidence. Pithouses 1 and 2, reported in Condie (1982, 1987), were constructed a little later or were built at the same time and inhabited into the A.D. 900s.

The significance of the house’s partially surface and partially semisubterranean character, the result of the builders’ siting it on a 25-degree slope, is unclear. Stuart and Farwell (1983:146-148) attempted to test whether the depth of post-A.D. 1000 pithouses reflects climatic regimes, but results were mixed. The two shallowest pithouses at LA 3289 and 3290, approximately 2 km to the south, were also the earliest at those sites. Peckham (1957:68) dated them to Basketmaker III on the basis of the pottery. Pithouses 1 and 2 at LA 5685 were excavated 1.2 and 1.9 m below then-existing grade, compared with the .7 m below grade on the upslope side of Pithouse 3 and at grade on the downslope side. Without dendrochronological data, we can only remark on the differences in depth, relative to temporal periods.

Evidence internal to Pithouse 3 demonstrates fairly clearly that the house continued to be used as a traveler’s refuge for some years after its abandonment. The unusual fuel in both Hearths 2 and 3 suggests hasty gathering, perhaps during sudden storms. The blackened but not cracked quartzite cobbles in both pits denote warming rather than cooking fires. And Hearth 2’s location is dangerously close to the house perimeter for a fire built by anyone who had a vested interest in the house. The 18-cm-deep ash in Hearth 1, the central hearth, may indicate cooking fires subsequent to abandonment or may just reflect sloppy housekeeping by the original inhabitants. Several burned roof members lying at angles on clean drifts of sand add another hint that time lapsed between abandonment and the destroying inferno. It was suggested that Pithouses 1 and 2 had been used after abandonment (Condie 1982:45, 1987:219), but with far less evidence than Pithouse 3 provides.

Across the river to the west, Schmader (1994) was able to delineate maintained food-preparation or sleeping space,

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peripheral space for eating or sleeping, and concentrated space for features and for tool and debris accumulations by carefully plotting artifact densities. Since the Pithouse 3 fill was an exemplar of disturbed stratigraphy, we were able to discern no such patterns.

Ceramics attest that trade relationships with groups to the west seem to have been totally lacking during the occupation of Pithouse 3. Ceramic trade with the Mogollon and Cibola districts was initiated at some time during the habitation of Pithouses 1 and 2 at Nighthawk. Though the Pithouse 3 residents were not trading to the west, they were either trading with people well to the east or southeast or were actually traveling to the Canadian River or the Pecos River south of Roswell for Unionid shell for jewelry. It could be that the Unionid shell in Pithouse 3 is the first glimmer of a Plains-Pueblo relationship that began in the A.D. 800s and lasted until the abandonment of the Salinas District in the 1670s.

—Quivira Research Center, Albuquerque

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The Jornada Experimental Range (JER) in south-central New Mexico has served as a field research laboratory since its establishment in 1912. The varied scientific activities on the range throughout this century have led to important discoveries about desert ecosystems that have been the basis for principles of land management that have application around the globe. This region is probably the most extensively studied desert on earth, and on-site research activities continue to flourish as we approach the next millennium. From microscopic-scale studies of soil microorganisms to synoptic-scale assessments of vegetation patterns detected from satellite-based sensors, JER is addressing a multitude of research needs relevant to natural resource management issues. One phenomena that we have continually observed in our studies over the years is that small events can have cascading effects on ecosystem structures and functions. A period of drought, an innocuous introduction of an alien species, unmanaged grazing, or dispersal of seed into a new area are examples of events that can have far-reaching effects in subsequent decades. Like these biological events, the inception of JER was based on a relatively small event that has then cascaded into the legacy of scientific discovery that is the Jornada range today. In 1904, Harvey Ringer, a man not particularly interested in the cattle business, sold 16 ha of land in the south-central portion of the 3,000 km² Jornada Plain to a man from Texas, Mr. C. T. Turney.

INTRODUCTION

The Jornada Basin in south-central New Mexico is often called the Jornada del Muerto (journey of the dead). It lies to the east of the Rio Grande on a plain 100 m above the river. The San Andres Mountains border it on the east; the Doña Ana Mountains correspond to the southern reaches; and the lava fields adjacent to Frá Cristobals form the northern limits. The plain varies in width from 8–50 km and is about 150 km long. The plain is primarily a closed basin with limited external drainage on the west edge.

Livestock were introduced from Mexico into this region during the early part of the sixteenth century (Hastings and Turner 1965). However, grazing was limited for over 250 years to the Rio Grande valley and adjacent slopes because of lack of surface water in the surrounding basins, including the Jornada. Some water could be found in springs and seeps in the mountains, but
supplies were ephemeral and livestock use was sporadic.

The Jornada Plain began to be settled following passage of the Homestead Act of 1862 and the end of the Civil War. The first well on the plain was dug in 1867 at the Aléman Ranch along the southern portion of the Santa Fe Trail north of the Doña Ana Mountains. Yet, it was not until 1888 when the Detroit and Rio Grande Livestock Company pumped water from the river to a tank on the mesa and piped it to troughs 10 km to the western side of the plain that livestock grazing spread into the Jornada grasslands. Originally owned by U.S. Army officers from Michigan, the Detroit Company began to assemble grazing rights across the Jornada Plain during this period, and grazing use increased. In the later part of the century, the Bar Cross brand (and the 20 or so other purchased brands) of the Detroit Company could be found on 20,000 cattle, including 1,000 bulls on the Jornada Plain. The number of other stock, especially horses, is unknown, but is assumed to have been substantial.

Grazing was more limited on the sporadically distributed homesteads based around springs on the east side of the Jornada Plain. At Goldenburg Springs on the west slope of the San Andres, the three Goldenburg brothers reportedly watered 1,800 cows in the very early 1900s. Lack of developed water in the central and eastern regions of the plain limited livestock distribution in the area. The first wells were drilled in 1903 by Harvey Ringer at the current site of the Jornada Experimental Range (JER) Headquarters and at Red Lake and Middle Well (on the current JER). Ringer had begun to purchase portions of the Bar Cross from the Detroit Company as that ranch was dissolved, probably triggered by the severe drought of the 1890–1893 period.

THE TURNEY INVOLVEMENT

Charles Travis Turney was from Sutton County, Texas. Born in 1857 and on his own from the age of 8, C. T. Turney had spent his life working as a cowboy. Turney and some of his fellow Texans had decided that land had become too expensive in Texas and that the New Mexico Territory was their land of opportunity. He first traveled into New Mexico in 1900 and registered his t-hook brand. In 1902, he began moving a herd of cattle from Texas to southern New Mexico. He was delayed in the Pecos area for a year because of animal-quarantine restrictions but eventually arrived in Doña Ana County in 1904. In January 1904, Turney purchased the 16-ha lots at the headquarters site, Middle Well, and Red Lake, and $4,000 worth of cattle from Harvey Ringer. Then in February 1904, he moved his family to Mesilla and began building his ranch and farm enterprises. In the following eight years Turney purchased from other homesteaders in the area (including Joe Taylor and Hugo Seaburg) an additional 6 wells on 80 ha and shipped or trailed to the Jornada an additional 3,000 cattle. By 1912, Turney held deed to 120 ha and 9 wells that provided grazing rights to over 80,000 ha on the Jornada Plain for his 4,000-5,000 head of cattle. In fact, by 1912 he had already constructed fence around a portion of the borders of his ranch.

Concurrent with the expansion of livestock grazing in the late 1800s throughout the southwest region was a noticeable decline in rangeland conditions (Smith 1899). In New Mexico, deteriorated rangeland conditions were first documented by E. O. Wooton (1908). Wooton, a profes-
sor at New Mexico College of Agriculture and Mechanical Arts in Las Cruces, had spent years documenting rangeland conditions through the state (Allred 1990). In his first thorough report on the subject (Wooton 1908), he included results of a survey of southwestern cattlemen on the condition of regional rangelands. Of the 118 responses, 16 stockmen felt that rangeland conditions had improved in recent years, and 102 responded that there had been significant declines in grazing capacities. Of these 102 responses, 69 attributed the declines to overgrazing, and 33 blamed drought conditions. These observations were fairly universal and led to the first fledgling attempts at range research to develop suitable management and improvement practices by 1890 on small areas in the Texas panhandle (Smith 1899). Wooton had initiated his own experiments by 1904, but he was frustrated by the lack of a suitably large area for research that would have application to the large ranches typical in the Southwest.

Some of Wooton's early experiments were conducted on Turney's ranch on the Jornada Plain. Turney had fairly quickly become one of the prominent ranchers in the area, and it is apparent that he and Wooton established a rapport on the benefits of this research. It is also evident that the creation of a large reserve for research could serve to secure grazing rights for the cooperating rancher. A large reserve, the first of a significant size, had already been established in Arizona south of Tucson. Wooton left the College in Las Cruces in 1911 to serve as an agricultural economist for the U.S. Department of Agriculture in Washington, D.C. From this post he orchestrated the creation of the Jornada Range Reserve in 1912 from withdrawn, public-domain lands surrounding Turney's nine scattered holdings on the Jornada. President Taft signed Executive Order 1526, creating the Jornada Range Reserve 124 days after New Mexico was awarded statehood. Established within the USDA's Bureau of Plant Industry, Wooton returned to New Mexico to oversee the reserve's establishment. One of the first collaborations between Turney and Wooton at the Reserve was the completion of the perimeter boundary fence that secured Turney's sole use of the southeastern portion of the Jornada Plain. This was 22 years before the passage of the Grazing Act in 1934, which would establish grazing rights for ranchers using much of the remainder of the unpatented public domain in the western United States. Wooton's photograph of the fencing crew in 1912 has appeared widely in publications and brochures on western rangelands over the last several decades (Figure 1).

Surprisingly, given his role in establishing the Reserve and his successful collaboration with Turney, Wooton only remained as Superintendent until 1915. At that time, the USDA transferred the Reserve to the Forest Service and appointed a new director, C. Forsling. The U.S. Forest Service had established an in-house research program that was quickly creating a presence throughout the western United States. The research on the Jornada Plain began in earnest under Forsling's direction.

The initial objectives, as detailed in the 1915 Memorandum of Understanding between the Forest Service and Mr. Turney, were to

1. Develop a range-management plan to minimize stock loss during drought;
2. Establish a system of forage utilization consistent with growth requirements of forage species and which will build up depleted range and minimize nonuse losses;

3. Identify advantages of controlling stock and the range for improving stock performance;

4. Quantify carrying capacity of native range under control and comparative capacity of these lands without control;

5. Identify costs of handling stock under controlled conditions compared to uncontrolled conditions;

6. Quantify loss of stock under controlled conditions compared to uncontrolled conditions;

7. Identify number and distribution of stock-watering places necessary to secure proper use; and

8. Examine the possibility of range improvements by introduction of new plants, seed planting, conservation of runoff, etc.

Unfortunately, Turney's tenure on the Jornada was also brief. Success during the early years led to expansion of his farming and ranching enterprises. In fact, in 1919 he bought the Bar Cross ranch from James L.
Hurt. However, extended drought from 1916 to 1919 and a disastrous loss of cattle shipped into Mexico forced Turney to sell his interests in the Jornada in 1925. Yet, the mission of the Reserve had been established, and the legacy of Turney (and Wooton) was secure. C. T. Turney died in 1930.

RESEARCH HISTORY

Obviously, implicit in the original goals of the Range Reserve was to demonstrate the advantages for both stock and the land of controlling the grazing use of the open range. The subsequent record of research on JER provides considerable insight into the developmental history of our western rangelands during the twentieth century. This record can be categorized into six principle themes: range management, husbandry, ecology, improvements, interdisciplinary sciences, and ecosystem science.

Range Management

A key problem for range management was quickly identified as inaccurate judgement of carrying capacity (Wooton 1915). The JER research program focused on quantifying proper utilization levels of the principle species. Jardine and Forsling (1922) established early guidelines for carrying capacities of black grama (Bouteloua eriopoda) rangelands. Subsequent research during ensuing decades has reinforced the accuracy of these guidelines, as Campbell and Crafts (1938), Paulsen and Ares (1962), and Holechek and others (1994) have reached strikingly similar conclusions. These authors all conclude that proper utilization of black grama should be less than 40 percent of the current year’s growth.

The original philosophy was that proper utilization of the leaves and stems of the main forage plants was the basic principle of range management (Canfield 1939). General-management guidelines published in the 1910s and 1920s are very similar to those promoted today. For example, nearly 80 years ago Jardine and Forsling (1922) recommended the following drought strategies: (1) limit breeding stock to carrying capacities during drought, (2) utilize surplus stock during good forage years depending upon market conditions, (3) adjust range use seasonally depending upon growth characteristics of key species, (4) establish permanent watering points no more than 8 km (5 mi) apart, and (5) establish both herding and salting practices that achieve optimal stock distribution. Similar recommendations for drought conditions are outlined in one of the most current textbooks on range management (see Holechek et al. 1995).

Husbandry

Initial research on livestock production also emphasized strategies for drought. Most of the original efforts focused on supplemental feeding programs, especially those that used locally available feedstuffs such as cottonseed products. For example, general recommendations were for .45 to .9 km (1 to 2 lb) of supplemental protein to augment range forage for maintenance (Forsling 1924), with slightly higher quantities suggested for growth of stockers (Jardine and Forsling 1922). These general recommendations have persisted during ensuing decades. However, more recent research focuses on the use of protein and energy supplements for specific animal-production stages to trigger specific physiological activities (Gambill et al. 1994).

More novel research has emphasized specialized practices for emergency feed
conditions and management of poisonous plants. Soapweed (*Yucca elata*) was found to be a palatable emergency feed when fed chopped and fresh (Forsling 1919). Ensiling or preparation was not determined to be necessary. Other plant species were either deemed not suitable as emergency feeds (i.e., *Dasylirion wheeleri* and *Yucca macrocarpa*) or required spine removal (*Opuntia* spp.). Interestingly, burning spines from prickly pear cactus (Forsling [1924] estimated that one person could prepare cactus feed for 200 to 400 head of cattle in a day) was employed during the 1994–1995 drought in the southwestern United States. However, even in the 1910s and 1920s, the use of emergency feed practices was not viewed as responsible management for properly stocked rangelands.

As in other western rangeland regions, studies on poisonous plants provided both initial guidelines for livestock management and insight into the difficulties of plant control in a desert environment. For southern New Mexico, drymaria (*Drymaria pachyphylla*) became a problem in response to overgrazing (Little 1937). For clay soils, drymaria was viewed as an early seral or successional species (Campbell 1931). Avoidance of grazing in drymaria-infested areas was the recommended management strategy. Various measures of control (fencing, burning, spraying, and revegetation) were examined and determined to be either too expensive or ineffective. The recommended control practice was hoeing, but eradication was not viewed as a viable possibility. These general characteristics relative to management and control recommendations for poisonous plants persist today (James et al. 1993).

Development of techniques (such as esophageal fistulation) for animal nutrition research led to investigations of the interactions between plants and livestock. Early work identified foraging behaviors of different cattle breeds (Herbel and Nelson 1966), but regardless of breed, cattle are generalists in this environment. A current research emphasis is identification of animal production capabilities most suitable to forage characteristics of desert rangelands (Walker and Winder 1993). Cattle genotypes with relatively modest performance traits, such as milk production, would be more successful in this nutrient-sparse environment. It is possible that some desired characteristics will mirror those inherent to the original cattle breeds introduced to North America in the sixteenth century.

Research on plant-animal interactions now reflects the widespread distribution of shrubs in the Chihuahuan Desert. Foraging behaviors are strongly mediated by secondary plant chemistry (Estell et al. 1994), and chronic ingestion may have post-ingestive consequences that further shape preferences (Fredrickson et al. 1994). Remediation of shrub-dominated rangelands will require cost-effective technologies. The use of livestock as biocontrol agents for remediation will require detailed knowledge of this chemically mediated interaction in order to be an effective technology.

**Ecology**

One of the early objectives of JER was to understand the role of management in natural revegetation of rangelands (Jardine and Hurtt 1917). By the late 1920s, patterns of succession were described (Campbell 1929, 1931). These observations were generally in areas where livestock numbers had been substantially reduced (or eliminated) and year-long grazing had been adjusted to seasonal use. For example, on
sandy soils, five successional stages were described in the natural revegetation of sand dunes: (1) mat stage of low-prostrate annuals, (2) ruderal stage of large annual and perennial forbs, (3) snakeweed (Gutierrezia sarothrae) stage (viewed as critical), (4) dropseed (Sporobolus spp.) stage (regeneration of perennial grasslands), and (5) grama-grass stage. These observations reflected the succession-and-climax paradigm of the period.

However, these early observations did not portend larger-scale transformations that were documented over ensuing decades. Probably the defining publication from the first half-century of research in the Jornada Basin was Buffington and Herbel's (1965) reconstruction of vegetative changes in the area between 1858 and 1963. The broad-scale encroachment of shrubs was attributed to seed dispersal, heavy grazing, and periodic droughts (Buffington and Herbel 1965).

Concomitant with the vegetation dynamics has been substantial change in surface soils. Gibbens and others (1983) documented effects of wind erosion of soil fractions as an ungrazed landscape changed from perennial grassland to coppice dunes dominated by mesquite. Both soil movement and the redistribution of sand, silt, and clay fractions were substantial.

Emerging from this reconstruction and associated research has been a key postulate regarding changes in ecosystem properties that accompany grassland conversion to shrubland (desertification). The central hypothesis is that the distribution of soil resources is altered from spatially homogenous, as seen in semiarid grasslands, to heterogeneous, as seen in shrublands, with desertification (Schlesinger et al. 1990). Further, these emerging resource islands act as positive feedback to further the invasion and persistence of shrubs. This hypothesis has formed the basis for the research efforts of scientists affiliated with the Long-Term Ecological Research (LTER) program at the Jornada (Figure 2).

This hypothesis counters the earlier observations regarding the potential for disturbed lands in arid environments to naturally revegetate to semiarid grassland conditions. Current research in other arid regions would also support a hypothesis of nonlinear vegetation dynamics in these environments (for example, see Milton et al. 1994).

**Improvements**

The first articles on classic techniques for improving forage production on desert rangelands were published in the 1940s (Cassady and Glendening 1940; Parker 1943). These research efforts primarily focused on reseeding practices and a variety of brush-control methods. With the development of appropriate machinery (i.e., the rangeland drill) and herbicides, examinations of intensive improvement practices were a significant part of the research program for the next 45 years (Herbel and Ares 1961; Herbel and Gould 1970; Herbel et al. 1985; Parker 1949). The principles of these intensive improvements have been well articulated (Herbel 1983); however, more recent economic assessments of these practices have not been wholly favorable. For example, Sherwood (1994) concluded that over 95 percent of the possible reseeding practices suitable for the Jornada Basin would result in a negative economic return. Similar doubts have been raised regarding the cost effectiveness of
### Figure 2. The “Jornada Desertification” model.

A central hypothesis of research at the Jornada Experimental Range is that changes in vegetation are accompanied by a redistribution of water and soil resources in the landscape, which act as a positive-feedback mechanism to promote the desertification process.

The Jornada Desertification Model

<table>
<thead>
<tr>
<th>Uniform Distribution of Resources</th>
<th>ORIGINAL BLACK GRAMA GRASSLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shallow-rooted, photosynthesis closely coupled to availability of soil moisture</td>
</tr>
<tr>
<td></td>
<td>Infrequent horizontal transport of water &amp; nutrients</td>
</tr>
<tr>
<td></td>
<td>Mineralization &amp; uptake of nitrogen limited to surface soil</td>
</tr>
<tr>
<td></td>
<td>Tightly coupled cycles of water &amp; nitrogen</td>
</tr>
</tbody>
</table>

**Disturbance**

Overgrazing by domestic livestock, climate change, etc.

(Consequences: trampling, soil compaction, reduced plant cover, etc.)

**Increasing Heterogeneity in Distribution of Resources**

**GREATER RUNOFF, TRANSPORT OF WATER & NUTRIENTS BETWEEN ECOSYSTEMS**

**INCREASING SHRUBBY COMPONENT**

Cover of shrub species increased as a direct result of nonuniform distribution of water in space and time.

**Leading to:**

**AREAS OF GREATER ACCUMULATION OF WATER & NUTRIENTS**

i.e. islands of fertility beneath shrubs

**AREAS OF GREATER LOSS OF WATER & NUTRIENTS**

i.e. bare soil between shrubs

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Chemical methods for brush control (Herbel and Gould 1995).

One of the original objectives of the Experimental Range was to identify a management system that brings about natural reseeding of desired species (Jardine and Hurtt 1917). With our emphasis on developing specialized intensive technologies, we have not accomplished this original objective. Low-input techniques that are economical and effective are still required. Four premises need to be advanced: (1) biological integrity of both above- and belowground systems in addition to the short-term establishment of desired species is necessary to buffer against future disturbances; (2) resource redistribution over time at the community and landscape levels plays an important role in both desertification and restoration processes; (3) restoration efforts should focus on fertile sites best suited for re-establishment of native species; and (4) planting technologies should be
based on readily available "natural" dispersal systems (Herrick et al. 1995).

**Interdisciplinary Sciences**

Interdisciplinary research began in earnest in the 1960s. Rangeland science has typically been presented as an applied, interdisciplinary field, but involvement of related sciences (other than animal science and other directly related agricultural fields associated with range-livestock production) was slow to develop. The interactions with this new group of scientists occurred in conjunction with an expanding appreciation for the multiple uses and values of desert rangelands.

In the Jornada Basin, these interactions involved both biological and soil sciences. Gile (1966) provided new insights into soil-horizon development processes in arid environments. In particular, descriptions of clay illuviation in high-carbonate sediments greatly revised our understanding of argillic horizons in arid soils (Gile and Grossman 1968; Gile and Hawley 1972). These clay horizons develop slowly in deserts and can be masked by subsequent accumulations of carbonate.

Whitford and others (1983) provided initial insights into the role of decomposers and herbivores on nutrient cycling in the desert. For example, cleverly designed field studies identified the mass of subterranean termites (Gnathamitermes tubiformans) in the Jornada at 30 kg/ha (MacKay et al. 1989). Termites were estimated to recycle 11 percent of litter nitrogen and 13 percent of annual and grass standing crops (Schaefer and Whitford 1981).

Hundreds of studies in the past 25 years have expanded our knowledge on a range of topics, including soil biota (Virginia et al. 1992), biogeochemical processes (Schlesinger and Peterjohn 1991), nitrogen fixation (Herman et al. 1993), surface hydrology (Tromble 1988), primary production controls (Cunningham et al. 1979), effects of lagomorphs (Gibbens et al. 1993), and distributions of rodent populations (Hoover et al. 1977).

Although many of these topics require further research, we still have two particular, and different, research needs. First, this body of work lacks effective synthesis. Without complete and detailed synthesis, the application of this information to the management of these desert rangelands is seriously curtailed. Second, there is an overwhelming need for research on the roles of soil biological systems in the recovery of degraded lands (Whitford and Herrick 1995).

**Ecosystem Science**

The creation of the International Biological Program (IBP) provided the impetus for an ecosystem framework for research. The Jornada Basin was the location for the desert-grassland site within IBP. By the early 1970s, scientists had assessed system variables as a foundation for model development and expanded insight into ecosystem processes. For example, Pieper et al. (1972) quantified that 4 percent of captured energy was transferred from plants to herbivores in the desert.

As the IBP dissolved in the late 1970s, the LTER program emerged in the 1980s as its successor. The LTER, now in its second decade, has five core research efforts: (1) pattern and control of primary production; (2) spatial and temporal distribution of populations selected to represent trophic
structure; (3) pattern and control of organic matter accumulation in surface layers and sediments; (4) pattern of inorganic inputs and movements of nutrients through soils, groundwater, and surface waters; and (5) pattern and frequency of disturbances. Research in these core areas has provided a basis for modeling efforts. In particular, modeling has linked transport processes to the spatial and temporal dynamics of soil resources, a key premise of the Jornada model. Based on these efforts, the regional stability of desert ecosystems has been described as a function of resource distributions among smaller scale (patch) mosaics within the larger landscape (Reynolds et al. 1995). Understanding the cascading effects (both positive and negative) of both management and remediation practices in the desert will require the continued development of larger-scale ecosystem models.

CONTEXT OF RESEARCH HISTORY

Two prevailing themes arise from an analysis of the history of research conducted in the Jornada Basin. These themes are degradation and utilitarian environmentalism. JER has its roots in the deteriorated range conditions of the region during the later decades of the nineteenth century. Much of its research effort throughout the twentieth century was devoted to developing range-management practices suitable for degraded lands or intensive technologies for their improvement. Even today a central postulate of research is based upon a hypothesis of degradation processes (the Jornada model). Yet, if there is one key deficit to these research accomplishments, it is the failure to identify usable technologies for remediation of degraded conditions.

This failure is probably more a function of the dynamics of our environment, our economy, our attitudes, and our expectations than from an inefficient use of the scientific method. We now believe that remediation has to be accomplished in a more extensive fashion and based on a more complete knowledge of the basic ecological processes that occur in desert rangelands.

Since its establishment, JER's research program has included a significant element devoted to ecological studies. Livestock production and an understanding of the principles for managing the forage on which the range-livestock industry is based was the initial emphasis. However, the emerging principles have an ecological basis. Though an increasing emphasis is now placed on the study of ecological principles, livestock grazing as a viable use and tool for landscape management is still central to the research. This can best be labeled as utilitarian environmentalism, a concern for the long-term capacity to harvest food and fiber from a highly variable (transient) environment. Our terms for this goal, such as "proper use" and "sustainability," have not withstood rigorous examinations. The theme, though, has been and will continue to be how to use this resource based on a thorough understanding of our surroundings and our interactions with those surroundings.

HISTORY AS ANALOG

The history of research results from JER supports three emerging postulates from the broader body of rangeland science in recent years. These postulates are (1) many ecological processes have thresholds below and above which they become discontinuous, chaotic, or suspended; (2) ecological character is reflected by dominant species;
and (3) species are interdependent and many of these interdependencies form highly specialized interactions.

Many of the observations in the Jornada Basin during this century have documented surprisingly rapid changes across the landscape. Yet, our frustrations in effecting change, even with intense inputs, supports the second postulate. Remediation within this ecosystem will require specific knowledge of species interactions, which may have to be regenerated before corrective management actions will be effective. Needless to say, we can predict from our observations that simply abandoning the landscape will not promote recovery or prevent further deterioration.

Within this context, livestock grazing must be managed so as to neither disrupt species interactions or drive impacted processes beyond the thresholds. The average annual carrying capacity for this hot desert is 9.5 animal units/section. This would require the annual harvest of approximately 10-20 g of forage per m² with even distribution of grazing use. We have the basic management techniques for controlling grazing for this level of defoliation. However, we still need the ability to effectively monitor that use over large areas, detect impacts of use on key processes, more rapidly recognize seasonal forage dynamics, and develop methodologies for using the animal to effect desired changes.

CONCLUSIONS

Much of the research conducted during the early twentieth century is still applicable to today’s management issues. Though the experimental designs employed in the 1910s, 1920s, and 1930s might not entail the sophistication serviceable by current statistical analyses, the thoroughness and detail of the early field research more than compensate. In addition, the length of the research record itself becomes a powerful tool for insight and scientific speculation.

One perception that surfaces from a review of the research record of the Jornada Basin is the complexity of this arid ecosystem. This complexity cannot be easily communicated. Yet, these desert rangelands will continue to provide critical resources to a significant portion of the human population. It is important that we not oversimplify our understanding of this system in our attempts to communicate our knowledge to interested segments of our society. Solutions to today’s management problems are generally not simple, and we should not create false expectations. We need to use the full scientific history of experimental stations like the Jornada to create more complete understanding. This should be a prominent objective within our research programs. In fact, using the Jornada Experimental Range as a demonstration for our knowledge of desert rangelands was an original objective of C. T. Turney and E. O. Wooton, and it is still valid today.

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New Mexico State University,
Las Cruces
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TIJERAS ARROYO SITE, A REPORT OF THE 1939 EXCAVATION PROJECT

Wesley R. Hurt

The Tijeras Arroyo Site, which lies on the south side of Tijeras Arroyo just east of the old Coyote Canyon road and east of the junction of Coyote Canyon Arroyo. It was discovered by Herbert W. Dick in 1937 (Figure 1). At present, the area is located on the property of Sandia Base. The construction of a building destroyed most of the site. A visit to this site in 1985 by A. Helene Warren, William Sundt, and me revealed that a portion of the refuse lay on the east side of this building.

Dick, with several students from Albuquerque High School, did a limited amount of excavation at this site in 1938. The following year, Homer Barnette of the University of New Mexico, with Carroll W. Burroughs as an assistant and several students, engaged in further excavations. A substantial amount of the data in this report was taken from Burroughs’ unpublished manuscript on the 1939 excavation.¹

METHODS OF EXCAVATION

Dick and his associates in 1938 excavated a test pit in what appeared to be a promising area, indicated on a grid between SE 40-50 coordinates (Figure 1). Here they encountered an ovoid pit, with a depth varying from 1.8–2.4 m (6–8 ft), a length of 5.5 m (18 ft), and a width of 4.0 m (13 ft). In this pit were encountered sherds of many restorable vessels.

For the 1939 project, a grid consisting of 117 squares measuring 3 m (10 ft) was laid out with the 0 coordinate bisecting the mound. As a result, the coordinates ran diagonally to the cardinal directions. The datum point was 12 m (40 ft) to the north of the mound. The squares were numbered by the stake in the south corner. Thus, the first row of squares to the southwest of the 0 coordinate was named SW10 and that to the northeast, NE0.

EXCAVATION RESULTS

Excavations at the Tijeras Arroyo Site yielded information on a house, a refuse pit, and other features. Excavated areas are indicated on Figure 1.

¹ Wesley R. Hurt

The hacienda occupational level lay on top of a low natural mound about 50 m (160 ft) long and 30 m (100 ft) above the bed of the arroyo. On each side of the main mound were two smaller mounds, one at a distance of about 22.5 m (75 ft) and the other about 15 m (50 ft) away.
Figure 1. Excavations at Tijeras Arroyo Site in 1939.
Main House Features

Although no walls of the houses extended above the surface of the mound, their presence was observed as lines of moist soil that dried differentially following a rain. In tracing one of these moist lines in Square SE120-SW10, the walls of Room 1 were encountered (Figure 2).

The north wall, made of adobe, was oriented to the cardinal directions, as were the other walls. It was 5.6 m (18 ft 6 in.) long, while the east wall was 4.3 m (14 ft 2 in.). The south wall was traced for 5.2 m (17 ft) to where the wall was completely eroded away, without encountering a corner. The west wall was 1.4 m (4 ft 6 in.) long, terminating at a doorway that led into Room 3. This wall was only 36 cm (14 in.) high. All the walls of Room 1 were plastered with whitewash or slacked lime, about .3 cm (1/8 in.) thick.

Jutting out from the north wall into Room 1 was a flat-topped stone slab that was 38 cm (15 in.) wide, 28 cm (11 in.) long, and 20 cm (8 in.) thick (Figure 2). This may have served as a seat or a ledge for holding an object. There was also an aperture in the north wall near the junction with the west wall. This opening was framed by short walls that jutted diagonally outward for a distance of 38 cm (15 in.) on each side. A log was imbedded in the sill and was covered with adobe plaster, forming a raised platform 7.6 cm (3 in.) thick. A low molding abutted the rear of this threshold.

Room 2 lay to the east of Room 1 (Figure 2). A wall 38 cm (15 in.) thick separated the rooms (Figure 2). This wall extended southward from the northeast corner of Room 1 for 4.4 m (14 ft 5 in.) to a ledge of what appeared to be a fireplace. The ledge jutted into the room in the form of a parabolic curve for a distance of .4 m (18 in.) (Figure 3). It was rounded at the top and rose 10 cm (4 in.) above the floor level. On top of the basal platform was another layer that formed a step 15 cm (6 in.) high. The surface of the stepped platform and the adjoining wall were burned to a bright red color, indicating that this feature was the base of a fireplace. Because the adjoining wall was incomplete, it was not possible to determine if this were a conical corner fireplace typical of Spanish-American houses. The west wall behind the fireplace extended southward for only .3 cm (1 ft) to a point where it was eroded away.

The north wall of Room 2 extended east 2.6 m (8 ft 8 in.) from the corner shared with the west wall, to a point where the platform of another fireplace was encountered. The remnant of the platform, rounded at the top, was 5 cm (2 in.) high, .9 m (3 ft) wide, and extended into the room for .6 m (2 ft). The wall behind this fireplace had been eroded away (Figure 2). On top of the platform was a smaller ledge that had a circular depression within it. Possibly the platform was the base of an open hearth rather than a covered fireplace. In the area of the probable adjacent wall was a deposit of charcoal and burned corn cobs.

Only a small part of the walls of Room 3, which lay to the west of Room 1, was found. This included the east wall, shared with Room 1, and a section of the north wall, which extended westward from the northeast corner of Room 1 for a distance of about 1.5 m (5 ft). The remaining sections of the walls had been eroded away. The east wall was 20 cm (8 in.) thick and was plastered with whitewash. In the northwest corner of Room 3 was the remnant of a
Figure 2. Floor plan of rooms.
corner fireplace (Figures 2 and 4). The platform of this smooth-surfaced, neatly made structure was smoke blackened. It had a rounded top, was about .6 m (2 ft) high and .9 m (3 ft) wide, and extended into the room for 25 cm (10 in.). On the platform was a portion of the quarter-cone fireplace cover.

Because of lack of time, the fill in these three rooms was not completely removed. Instead, trenches that paralleled the walls were cut until the floors were found. In several places, small pits were cut into the floors to determine the floor structure. Very little refuse was found in the room fill other than sherds, charcoal, and wood fragments.

Prior to construction of the house walls, the top of the natural mound was leveled to the depth of about .3 m (1 ft), and apparently a layer of adobe was laid on this horizontal platform to serve as a floor for the rooms. All of the squares outside of Rooms 1, 2, and 3 were excavated to a maximum depth of about .3 m (1 ft), where the underlying sterile gravels were encountered.

**Additional House Features**

An attempt was made to find other house walls or walls of other structures. In Square SE140-SW10, segments of highly eroded adobe walls were encountered, as were fragments of plaster. The features and bits of wood in this square and in Square SE150-NE0 may indicate the presence of a room. In Square SE150-SW10 was a row of flat-topped rocks, each about .3 m (1 ft) thick and 20 cm (8 in.) long, a feature that may have served as a foundation of an adobe, above-ground room. This stone line was oriented north-south and thus matched the alignment to the cardinal direction of the other room walls.

In the northernmost area of the mound in Squares SE150-NE0 and SE160-SW10,
two small firepits were encountered, surrounded by layers of charcoal to depths of 15 cm (6 in.) and 30 cm (1 ft). In this refuse were also fire-blackened sherds and bits of wood. Squares SE160-SW30 and the unit to the southwest were sterile.

The Refuse Pit

Excavations in Squares SE50-SW10, SE50-NE0, SE50-NE10, SE40-SW10, SE40-NE0, and SE40-NE10 revealed layers of burnt bones at the depth of .15–.3 m (6 in. to 1 ft). Deeper excavations in this square and in the adjacent squares revealed the presence of a large refuse pit (Figure 1), which Dick believes was the same pit he partially excavated in 1938 and backfilled. The lower level of refuse of Square SE40-NE0 extended into Squares SE40-SE10 on the northeast and SE50-NE0 on the southwest. Square SE40-NE0 was excavated to the depth of about .6 m (2 ft) without finding any more cultural material; however, the SE40 grid line, the sloping border of the refuse pit was encountered (Figure 5). To determine the extent of the pit, a trench was excavated along the center of the mound, parallel to the NE0 grid line. The profile of this trench indicated that the pit extended about 1.5 m (5 ft) to the south (Figure 6). The shoulder of this pit also extended through Square SE50-SW10 for 1.2 m (4 ft) along the SW20 grid line. Excavation in the eastern third of Square SE50-NE0 along the SE30 grid line revealed that the upper .9 m (3 ft) of fill consisted of clay mixed with gravel. This fill lay over five thin, alternating layers of gravel mixed with charcoal; these overlay a stratum of sand mixed with gravel. Below this was a gravel stratum that lay on top of a layer of chunks of adobe.

How far the refuse pit extended in Square SE50-NE0 was not determined, but judging by the trench excavated along the SE40 grid line, the shoulder rose to the
Figure 5. Profile in trench through Refuse Pit at SE40-NE20.

Figure 6. Profile in trench through Refuse Pit from SE50-NE10 to SE50-NE20.
surface near Stake SE40-NE20 (Figure 7), while the depth seemed to be about 1.2 m (4 ft) below the surface. Judging by all the excavations made in the refuse pit, it was about 6 m (20 ft) long and 4 m (12 ft) wide. The depth of 1.2 m (4 ft) does not agree with the 2.4 m (8 ft) depth of the refuse pit excavated in 1938 by Dick. In addition, there was no evidence of Dick's backfilling, nor do the horizontal dimensions agree. Squares SE30-NE0 and SE40-SW10 were left intact for future excavation projects.

**Other Features**

In cutting a trench .6 m (2 ft) wide along the NE coordinate of the trash pit, a hard-packed adobe floor was encountered in Square SE40-NE0. This floor extended 1.2 m (4 ft) into Square SE50-NE0. Square SE50-NE0 was uncovered to the depth of .6 m (2 ft), where a possible burned floor was found. This floor was so hard it appears that it had been deliberately compacted. On top of the floor was a layer of gray ash covered with an unstratified clay deposit mixed with gravel, fire-hardened lumps of clay, and many sherds and bones. On the floor between the ash level and the overlying fill was a stratum of clay. On this floor were layers of ash and charcoal mixed with blackened sherds, charred and unburned bones, charred corn cobs and stalks, charred plant stems, and soil. On top of this burned kitchen refuse were loose soils mixed with many bones, pockets of egg shells, and other organic material. This was probably an area of the original ground surface outside of a house, which later served as a place to throw kitchen refuse.

![Figure 7. Profile of Refuse Pit along center line, SE40 to SE50.](image-url)
ARTIFACTS

Artifacts recovered from the Tijeras Arroyo Site were ceramic, historic glass and porcelain, metal, stone, and leather items. A. Helene Warren’s comments on the ceramics are included here.

Ceramics

A total of 2,851 sherds were excavated in 1939 and were initially described and classified by Burroughs, as indicated in Table 1. These same sherds were later reclassified by Hurt and Dick (1946) on the basis of sherds found on Spanish Mission sites, such as Quarai, and Spanish-American sites, such as Manzano. Dick (1968) further reclassified and renamed these types. Table 1 is a combined classification of the ceramics of the Tijeras Site, as given by Burroughs, Hurt, and Dick. The ceramic types are described below.

Type 1: Burnished black ware (Manzano Burnished Black ware). The type includes semihemispherical bowls with flared rims and constricted necks and jars with flared rims. Temper is ground sandstone. The surface is burnished.

Time and range: Dick (1968:82) has reclassified this type as Kapo Black. Kapo Black was originally named by Mera (n.d.:14–16), who considered it to be of Pueblo Indian manufacture and estimates its time period to be from the eighteenth century to well in the twentieth century. According to Warren (personal communication 1990), Kapo Black was continuously made from about 1630-1900. Dick (1968:82–83) states that it is found on sites from Antonito, Colorado, south to Isleta Pueblo, in the Indian and Hispanic villages along the Rio Grande and its tributaries, east of the Rio Grande from Pecos Pueblo through the Hispanic settlements to Manzano, New Mexico. It was also encountered in the Quarai Mission and Pueblo in the uppermost layers, 0–6 in. (0–15 cm) deep (Hurt 1990:212). The occupants of the Tijeras Arroyo Site probably obtained pottery of this type from trade with the Pueblo Indians.

According to Harlow (1973:40), Kapo Black died out about 1760 but continued in a modified form at Nambe, Pojoaque, and Santa Clara Pueblos.

Type 2: Black striated ware (Manzano Coarse ware or Carnue Plain) (Dick 1968). Paste is gray with a heavy sand temper. Outside surface is striated.

Time and range: Dick (1968) states that these ceramic types are distributed from Trinidad/Antonina sites in Colorado to an area south of Mesilla, New Mexico. Sherds of this type were found on the surface of the Quarai Mission and Pueblo site and thus represent a reoccupation of the site after it was abandoned in about 1676 (Wilson 1977). It was also encountered in the U.S. forts along the Rio Grande below Socorro in the years between 1850 and 1885. Warren (personal communication 1985), who examined specimens of this ware from the Tijeras Arroyo Site, stated that they were “late” in time, as was the ware described below.

Type 3: Coarse black culinary ware (Manzano Coarse ware or Carnúé Plain). The form is an open-mouthed jar. The pottery seems to be a thicker variant of Carnúé Plain, with the same time and range. The temper is ground sandstone.
Table 1. Ceramics from the Tijeras Arroyo Site.

<table>
<thead>
<tr>
<th>Burroughs</th>
<th>Hurt and Dick</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Burnished black ware</td>
<td>Manzano Burnished Black ware</td>
<td>6</td>
</tr>
<tr>
<td>2. Rough striated black ware</td>
<td>Manzano Coarse Black ware</td>
<td>25</td>
</tr>
<tr>
<td>3. Coarse black culinary ware</td>
<td>Manzano Coarse ware</td>
<td>17</td>
</tr>
<tr>
<td>4. Coarse ware with red bands</td>
<td>Manzano Coarse ware, Varieties A and B</td>
<td>22</td>
</tr>
<tr>
<td>5. Thin, smooth buff ware with red bands</td>
<td>Manzano Thin Red-on-buff ware</td>
<td>24</td>
</tr>
<tr>
<td>6. Matte paint wares (several types)</td>
<td>Manzano Thin Red-on-buff ware</td>
<td>6</td>
</tr>
</tbody>
</table>

Time and range: same as Carnué Plain, of which it is a variant.

Type 4. Coarse buff ware with red bands: Variety A (Manzano Coarse ware, Subtype A). The temper is sand. The sherds are washed with a brick-red slip on the inside, outside, or both surfaces; surfaces are roughly smoothed or slightly porous. On some vessels a red-painted band is found on the outside below the rim. Vessels with red band should be considered a variant of Dick's Casitas Red-on-buff ware.

Variant B (Manzano Coarse ware, Subtype A, Casitas Red-on-buff). Finer and harder than Variety A, it has a dark core in cross section. Both surfaces are slipped and well smoothed; the outside looks as if it has been paddled into shape on an anvil. There is a wide, painted red band below the rim on both surfaces. It is similar to Carnué Plain with the exception of the painted red bands.

Time and range: According to Dick (1968:80-81), these subtypes occur from Mesilla, New Mexico, up the Rio Grande valley and its tributaries as far north as Las Sauces, San Luis Valley, Colorado.

It also occurs in the Hispanic villages of the mountains paralleling the Rio Grande valley. At the ruins of the Quarai Mission and Convento, it is present in the 0-15 cm (0-6 in.) layer and thus probably in the reoccupation period after the original abandonment. Dick (1968) estimates the time range from A.D. 1630-1890. Some of the sherds from the Rio Balsas, Guerrero, and Michoacan collections of the University of New Mexico closely resemble these two subtypes of pottery (Hurt and Dick 1946:309). It is possible that this type of pottery was made by Hispanic peoples.

Type 5. Thin, smooth buff ware with red bands (Manzano Thin Red-on-buff). One variety has a gray-buff slip below the top of the rim and a gray-buff slip on both surfaces; another variety has a bright-red slip.
in the same position. Both varieties have a painted red band on both surfaces below the rim. This is a variant of Casitas Red-on-buff and has the same time and range distribution as the other varieties.

**Type 6: Polychrome matte paint ware** (several types represented). Variety 1: large ollas with rims flaring sharply outward. Designs are in red, black, yellow, and white. Variety 2: straight lines and chevrons in black, white, and red. Variety 3: circular designs in red or black. Variety 4: designs of curved, straight lines, and blocks in black, red, and buff; curved and straight lines in black on buff; and three sherds from an open-mouthed olla with a black and red design on a black background. Because of the lack of complete vessels, it is difficult to classify them according to recognized types. Nevertheless, they were probably made by Pueblo Indians and include such types as Powhoge Polychrome with a time range from 1750–1950, according to Dick.

**Miscellaneous matte paint sherds.** A single sherd has a dark red band on a red background. Three sherds are coarse, very thick, with sand temper and no slip; very faint painted designs appear on these. These types of pottery were probably made by Pueblo Indians.

**Unidentified Pueblo Indian Glaze Ware.** Several varieties of Glaze ware sherds belong to an earlier Pueblo Indian occupation of the area. There are two varieties of green glaze type, one a medium green and the other a dark green. The glaze completely covers the sherds. According to Warren (personal communication 1985), the green, yellow, and brown over-all glazes, including some polychromes, are common on Spanish-American sites in New Mexico and Arizona; they were probably made in Mexico and are usually post-1700 in age.

**Unidentified Pueblo Indian Glaze Wares.** Eight Pueblo Indian glazed sherds were found. The association with the Tijeras Arroyo Site was probably fortuitous, as they probably came from the Pueblo Indian site on the opposite side of the Tijeras Arroyo, characterized by Glaze A sherds.

**The Spanish Glaze Wares.** According to Warren (personal communication 1985), the green, yellow, polychrome, and brown glazes that completely cover the pottery are common in Hispanic sites in New Mexico and Arizona and usually post-1700 in age and continue into "Late Historic Time," for example at the Las Majadas Site near Cochiti. They were probably made in Chihuahua, Mexico.

**Stoneware.** There were four sherds from possible Mexican "olive jars"; one is white, another yellow-brown, and two were green.

**Worked sherd.** This was a sherd with a rectangular form and a red-on-buff design; it was 6.4 cm (2½ in.) long, 5.7 cm (2¼ in.) wide, and had a rounded edge resulting probably from its use as a scraper or smoother for pottery making.

**Warren's Analysis of Sherds Found in 1985**

A total of 83 sherds were found during the 1985 visit, with fragments of window glass, two sherds of white china, and fragments of milk glass (A. Helene Warren, personal communication 1985).

Sherds with mineral-paint polychrome can be classified as Puname Polychrome from Zia and Santa Ana Pueblos. This type
is still being produced at the former village. Five sherds have been identified as Casitas Red-on-brown. Remnants of land snails were noted in the Casitas Red-on-buff and polished red ware sherds and also in a number of Carnué Plain sherds. The presence of snail shells suggests that the Hispanic potters chose ciénega or bog clays to produce the pots. No snail shells have ever been reported in Pueblo sherds. Snail shells were also found in the earliest ceramics of Hispanic dwellings in the Cochiti area. This site, Las Majadas (LA 591), was probably occupied during the mid-1600s according to Warren (personal communication 1985). The polished black sherds had sandstone temper, probably of the local Caja member of the Santa Fe sandstone. A fragment of a cream-colored utility vessel appears to have been made in the Hopi villages. Several sherds are prehistoric Santa Fe Black-on-white. There also were four fragments of a soda bottle with a brand "Coyote Springs Mineral Water." Adolph Harsch was the owner of the Coyote Bottling work in 1878.

Porcelain and Glass

Several examples of porcelain and glass sherds were encountered. They were not classified into types.

Metal Artifacts

Metal artifacts included a charred pewter spoon, an iron spoon, a rusted knife blade, three handmade nails with square shanks, and an iron rivet.

Stone Artifacts

Two manos, one made of sandstone and the other of a conglomerate, were found. There was also half of a concretion.

Several pieces of flaked and retouched obsidian, chert, and chalcedony were present. One was a rectangular flake of obsidian that was 3.8 cm (1.5 in.) long. It was pressure-flaked and had the edge dulled from use as a scraper or gun flint.

Almost perfect workmanship on another artifact indicates a commercially manufactured gun flint. The edges are dulled from use. According to Christine Petersen (personal communication 1985), gun flints were used between 1620 and 1820 when the powder was ignited by percussion caps.

Leather Artifacts

Leather artifacts included a woman's shoe and heel and a belt from a harness.

SUMMARY AND CONCLUSIONS

This report describes the 1939 excavations by the University of New Mexico of a Spanish-American ranch site. The site lies on top of a natural gravel mound on the south side of Tijeras Arroyo east of the junction of Coyote Arroyo near the foot of the Manzano Mountains to the east of Albuquerque. The construction of a building by Sandia Base destroyed the major part of the site.

Initially the top of the mound was leveled for the construction of a multiroomed adobe house with inside walls that were whitewashed. In one area, apparently the walls rested on top of a single row of foundation stones. Floors within the rooms were of compacted adobe. In the rooms were several of the typical Spanish-American adobe corner fireplaces. There was also a platform for an open hearth. The ground surfaces of the areas
adjacent to the house were compacted, and a small amount of refuse was thrown there, a custom not typical of present-day Spanish-American houses. There was also a large pit into which was thrown additional refuse.

I am not aware of historical documents that mention this site. Quintana and Kayser (1980) have summarized the known records that document the settlements in the nearby Tijeras Canyon, but they make no reference to this site. Nevertheless, the documents cited by these authors provide a probable date for the construction of the Tijeras Arroyo Site. The major events that occurred in the settlements of Tijeras Canyon of relevance to the Tijeras Arroyo Site were:

1. In 1818 the Governor of New Mexico approved a land grant that included the area of the Tijeras Arroyo Site with a south border along the Coyote Canyon Arroyo that runs into the Tijeras Arroyo west of the site. New settlements, in addition to the Carnué village in Tijeras Canyon, were permitted, but the Tijeras Arroyo Site was not mentioned.

2. The Census of 1880 lists only Carnuel (variously named Carnué and San Miguel de Loredo), San Antonio, Cañoncito, Sedillo, and Ranchito, none of which is in the area of the Tijeras Arroyo Site, since they all lie to the east in Tijeras Canyon and on the east side of the Sandia Mountains. In addition, this site was a single house and, therefore, may not meet the criteria to be recorded in the 1880 Census. Thus, the information in the above archives does not aid very much in the dating of the Tijeras Arroyo Site.

3. Another document relevant to the Tijeras Arroyo Site is the map of the Expeditions of 1774, and 1776 under the command of 1st Lt. P.M. and 1st Lt. F.C. Morrison (facsimile of the original in the collections of the Museum of New Mexico). The map shows an intersection of roads that lead to Isleta Pueblo, Coyote Canyon, Tijeras Canyon, and Albuquerque. Although this intersection is near or at the Tijeras Arroyo Site, no house is shown on this map. The absence of the house on this map may be of no significance, for none of the Tijeras Canyon villages are drawn on this map. It is possible that the Tijeras Canyon house may have been a travelers' stop on an important intersection of roads prior to 1776.

The presence of a gun flint at the Tijeras Arroyo Site may indicate a pre-Civil War date. It is possible, however, that the inhabitants of this site were using a flint-and-steel rifle long after the Civil War. Nevertheless, on the basis of sherds found at the site in 1985, Warren (personal communication 1985) suggests that the site was occupied between A.D. 1850 to 1900 or later.

In summary, the ceramic and other evidence given here suggest that the Tijeras Arroyo Site may have been inhabited sometime between 1817 and the Civil War and that occupation continued to early in the 1900s.

The function of this site is unknown, but there is no question that it was a Spanish-American house having all the typical architectural features and furnishings, such as corner fireplaces, and artifacts, such as grinding stones. The presence of domesticated crops—such as corn cobs, corn
stalks, seeds of pumpkin, squash, and watermelon, and pits of plum and peach—in the refuse suggest that it was a farm house. Although running water of Tijeras and Coyote Creeks does not reach the vicinity of the site, it is possible that during past wet cycles these creeks may have run at least as far as the site and furnished water for a limited amount of irrigation. The area of the site was probably chosen, however, because of its strategic location at the intersection of cross roads. Perhaps it served as a place to accommodate travelers.

Numerous bones of deer, sheep, and other small ungulates as well as bird bones and egg shells indicate that subsistence was also based on hunting and the raising of small birds and animals. On the basis of information obtained from Manzano, it is possible that the pottery types, such as Carnué Coarse ware and Carnué Red-on-buff, were made by Spanish-Americans. Supporting this hypothesis is the fact that these wares sometimes had temper made of locally occurring sandstone and a paste containing snail shells, the latter trait unknown in Pueblo Indian ceramics. In the Manzano Mountain communities of Manzano and Chato, local Spanish-American informants of mine claim that at one time their ancestors made pottery. Trade with the Pueblo Indians is indicated by the various types of matte-paint wares and with Mexico by the over-all green-glazed olive jars.

—Albuquerque

ENDNOTES

1 The site has apparently not been entered into the Laboratory of Anthropology system, as no LA number could be found for the site. Field notes used for this article are on file with Carroll Burroughs.

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Reconnaissance geological mapping and archaeological surveys of the Lake Trinity Basin in the northwestern section of the White Sands Missile Range (WSMR), New Mexico, have demonstrated an important relationship between the basin floor, margins, and land forms surrounding the basin and the human utilization of the area for over 10,000 years. Lake Trinity was a Pleistocene-age lake located in the northern section of the Jornada del Muerto. Today, the remnant lake basin is a grass-covered playa that rarely holds water. In this paper, we present the results of the geological mapping project, summarize the results of several archaeological surveys in the Lake Trinity Basin, and suggest patterns of human occupation and use of the region.

SETTING

The Jornada del Muerto is a large, closed basin extending from Bingham on the north to Las Cruces on the south. Keyes (1905) described the depression as a broad syncline bounded by flanking uplifts. Major landforms in the Jornada del Muerto Basin consist of extensive alluvial plains, fans, and valleys along mountain fronts; piedmont slopes; small playa depressions; and Quaternary basalt flows (Gile et al. 1981).

Three biotic communities are present in this region of the Jornada del Muerto. The Chihuahuan Desertscrub and the Semidesert Grassland interfinger at the lower elevations, depending on topographic conditions. The Great Basin Conifer Woodlands are found in the upper elevations of the Fairview, Oscura, and San Andres Mountains. The Chihuahuan Desertscrub community (Brown 1982) is characterized by creosotebush (Larrea tridentata), American tamarisk (Flourensia cernua), four-wing saltbush (Atriplex canescens), mesquite (Prosopis juliflora), ocotillo (Fouquieria splendens), and Mormon tea (Ephedra trifurca). The Semidesert Grassland community (Brown 1982) is primarily a Chihuahuan desert grassland that surrounds the lower-elevation desertscrub community. At its lower elevations, the two communities interfinger, creating a complex mosaic of plant distribution. Grassland-community species include grama grass (Bouteloua spp.), tobosa grass (Hilaria mutica), yucca (Yucca elata, Y. baccata), bear grass (Nolina sp.), agave (Agave parryi), and little-leaf sumac (Rhus microphylla). The Great Basin Conifer Woodland is composed of juniper (Juniperus monosperma, J. osteosperma) and piñon pine (Pinus edulis) (Brown 1982). The woodland is generally...
present from the lower slopes to the upland areas of the mountain ranges.

The climate of the Jornada del Muerto is similar to the climate in the arid-to-semiarid portions of the Tularosa Basin (Houghton 1976: 59–60). The average annual precipitation ranges from less than 20 cm (8 in.) on the basin floor to over 46 cm (18 in.) at the lower elevations of the Oscura Mountains. The rainy season is from July to September when approximately half of the annual rain falls during thunderstorms. The mean annual air temperature on the basin floor ranges from 17 degrees C (62 degrees F) near White Sands Headquarters to 12 degrees C (54 degrees F) up range.

Surface water, a scarce resource in the northern Jornada del Muerto, comes as runoff from storms. No major riverine or arroyo systems flow through the area. No springs exist in the area. Early settlers depended on hand-dug wells for water. Many small, braided arroyos bring water from the slopes of the Fairview, San Andres, and Oscura Mountains onto the basin floor. Historic placement of dirt tanks for capturing runoff to water livestock reflects the drainage patterns.

The histories of Pleistocene vegetation and climate in this region of the northern Chihuahuan Desert have been documented in detail by Van Devender (1990) and Van Devender and Toolin (1983). Plant remains from fossil pack rat and porcupine middens in the San Andres and Sacramento Mountains have documented major changes in the plant communities in these ranges over the last 18,000 years. At the upper elevations, the mixed conifer forest evolved into a juniper-oak woodland during the Early and Middle Holocene. The woodland shifted toward a grassland during the Late Holocene (beginning about 4,000 years ago). At the lower elevations, the juniper-oak woodland evolved into a desert grassland during the Middle Holocene and to a Chihuahuan desertscrub by the Late Holocene.

**GEOLOGY**

Lake Trinity Basin and surrounding areas were mapped by Weber directly onto U.S. Geological Survey 7.5-minute series (topographic) and 7.5-minute series orthophotomap (topographic) quadrangles—Blakemore Well, Fairview Mountain, Foster Well, Fuller Ranch, Granjean Well, Greens Baber Well, Harriet Ranch, and Salinas Peak NW—at a scale of 1:24,000. Map locations were plotted using GPS (Global Positioning System) satellite instrumentation.

**Lake Trinity**

Lake Trinity was the lesser of two late Pleistocene lakes on the missile range, the major one being Lake Otero and its reduced successor, Lake Lucero, at White Sands National Monument (Kottlowski et al. 1965). The modern playa of Lake Lucero is noteworthy as the windblown source of the spectacular white gypsum sand dunes that provide the main attraction of the monument. Lakes Trinity and Otero occupied separate intermontane basins on opposite sides of the Sierra Oscura-San Andres Mountain chain; Lake Otero in the Tularosa Basin to the southeast and Lake Trinity in the northern Jornada del Muerto to the northwest. Both are structural valleys of closed, interior drainage.

Earlier studies by Neal (1976) and Neal and others (1983) applied the term Lake Trinity in recognition of its proximity to the world’s first atomic bomb test at the Trinity
Site. In the 1983 report, Neal and others provide the first definitive description of the geology of the basin. They recognized the last high stand of water, evidenced by strand lines, and the presence of a thick sequence of lacustrine evaporite deposits of gypsum and hexahydrite beneath the lake floor, as evidenced in four exploratory bore holes.

The primary drainage into the basin is Chupadera Arroyo, which drains the southern portion of Chupadera Mesa (Figure 1). During the Pleistocene, it was a perennial stream. Lake Trinity also was filled with water that originated as surface runoff from the San Andres Mountains to the southeast and east and the Oscura Mountains to the northeast. Neal and others recognized relict shorelines at 1,431 m (4,695 ft), and Weber mapped a lower shoreline at 1,428 m (4,685 ft), as shown in Figure 2, a highly reduced version of Weber's field map. Although the 1,431-m level constitutes the last recognizable high stand of the lake, still older and higher levels to 1,442 m (4,731 ft) are indicated by lacustrine deposits now exposed in historic 1880s hand-dug wells and modern borrow pits northward of the upper shoreline. A sill at approximately 1,443 m (4,735 ft) adjoining the southern margin of the Jornada basalt flows, 3.2 km (2 mi) west of the western tip of the lake, now limits the maximum level that the lake could have attained.

The lake, as shown in Figure 2, extended for a length of 37 km (23 mi) along its arcuate central axis, with a maximum width of 9.6 km (6 mi) at the northern end; areal extent was approximately 212 km$^2$ (80 mi$^2$). A small, separate basin lies a short distance north of the southwestern lobe of the main basin (Figure 2). It retains a weakly developed shoreline at 1,431 m (4,695 ft), coincident with the recorded high stand (shoreline) of Lake Trinity. Several smaller depressions to the northeast, as shown on the Blakemore Well quadrangle, are enclosed by the 1,433-m (4,700-ft) contour and accordingly may have contained impoundments to the 1,431-m level.

Maximum relief between the upper shoreline and the floor of Lake Trinity is only 6.4 m (21 ft), indicating a very shallow water depth in the late stage of the lake. That the waters remained shallow throughout most of the history of the lake is indicated by the prevalence of sulfate evaporites in its stratigraphic record (Neal 1976; Neal et al. 1983).

The lower shoreline at 1,428 m could not be traced around the northern lobe of the basin, because the gentle slope of the stripped gypsum lake floor has inhibited its formation. It appears to have been buried by sheet wash along part of the southern shore and has been projected across a long interval along the eastern side where it was unrecognizable.

The upper shoreline at 1,431 m has been concealed by eolian sand drift from the dune field along the western and part of the northwestern shore of the northern lobe and by slope wash from the piedmont slope along part of the south shore. Several small playas in the southwestern lobe are expressed as barren mud flats with only weakly developed partial shorelines.

Although no definitive dates have been obtained for Lake Trinity or the deposits within its basin, it is believed to have resulted from pluvial conditions of the late Pleistocene, probably of Wisconsinan age, in common with other late Pleistocene
Figure 1. Regional location of Pleistocene Lake Trinity.
Figure 2. Synoptic map of Lake Trinity Basin.
lakes in central and west-central New Mexico.

**Ancestral Rio Grande**

Traces of exotic pebbles, among which obsidian is particularly diagnostic, record the meandering course of an ancestral stage of the Rio Grande through the area now occupied by the southwestern lobe of Lake Trinity, extending as far east as the eastern edge of the Blakemore Well quadrangle. These deposits were not mapped, inasmuch as they are largely engulfed by gypsum caliche (shown as Qcs on Figure 1). Excellent exposures of riverine gravely sands containing obsidian pebbles are widespread a short distance west of Sand Mountain, 27 km (17 mi) to the northwest. These deposits remain undated but are expected to interfinger with alluvial-fan deposits (Qaf) from the mountains to the east and south.

**Alluvial Fan Deposits (Qaf)**

Distal deposits of coalescent alluvial fans extend westward and northward to the eastern and southern margins of Lake Trinity basin from the mountain fronts of the Sierra Oscura, Mockingbird Gap Hills, and northern San Andres Mountains. These deposits form the piedmont slope (bajada) of the ranges, grading from coarse, bouldery gravels at the mountain front to finer gravels, sands, and silts basinward. Arroyos draining these slopes are major sources of clastic sediments and probably solution-transported calcium sulfate in the lake basin. Exposed upper parts of the alluvial fan deposits are probably of Pleistocene and Holocene age, but older parts are likely to date to late Tertiary time.

**Gypsum Deposits (Qcs)**

Gypsum deposits of two diverse origins are prevalent throughout the basin of Lake Trinity, one of which extends into the adjacent uplands. The older of these consists of massive, indurated gypsum caliche of pedogenic origin and regional extent in the northern Jornada del Muerto. It is widespread around the margins of the basin extending out onto the basin floor and underlying younger deposits to the north and west. In contrast to the flat-lying gypsum beds deposited in the lake, the caliche is draped over a landscape of greater relief than the present one (Weber 1973), where it forms a mappable lithostratigraphic unit. This unit developed as a gypsic horizon (Ccs) of a zonal paleosol (Soil Survey Staff 1962:181) under arid conditions during the late Pleistocene. The upper horizons have been removed by erosion. With its relative resistance to erosion, the unit stands in relief as capped benches, ridges, hummocks, and islands in and around the lake basin and on broad eroded flats on the northwestern lake floor. This gypsum unit appears to extend under the southeastern edge of the Jornada basalt flows, suggesting an earlier age than the lava.

Massive lacustrine gypsum beds are largely covered by later deposits, but, where exposed at the surface, these are difficult to distinguish from the pedogenic gypsum, except in borrow pits or other excavations. Both of these gypsum units are included in the Yesum-Holloman soil association (symbol OB) by Neher and Bailey (1976:Sheets 1 and 3).
**Jornada Basalt (Qb)**

Basaltic lava flows that erupted from a central vent abut the northern and western margins of the southwestern lobe of the basin, in part delimiting the upper shoreline against steep flow fronts. The western margin of the flows descends nearly to the present level of the Rio Grande and probably initially blocked and diverted its flow at some time in the late Pleistocene. The hummock-and-hollow topography of the lava field precluded the development of drainages across it, hence only minor contributions into Lake Trinity resulted from slight erosion of its margins.

**Dune Sands (Qds)**

A fairly extensive stabilized dune field adjoins most of the western and northern margins of the lake basin, spilling over onto the lake floor. The dunes are of longitudinal type, consisting of linear ridges trending northeasterly, bearing N54°E to N61.5°E, but commonly about N55°E. These trends reflect prevailing effective southwesterly wind directions commonly recorded in dune fields and ventifacts throughout the region. Grooved, sand-blasted andesite boulders on Sand Mountain to the north-northwest indicate effective winds from approximately SS9.5°W. Quite surprisingly, an opposed set from approximately N65°E is also prominently displayed. It is uncertain if these represent seasonal reversals of strong winds or effective winds of opposed direction during separate climatic regimes. Farther west, on the Plains of San Agustin, strong southwesterly winds are reflected in the location of dune fields on the northeastern sides of the linked basins of Pleistocene Lake San Agustin, the orientation of parabolic dunes, and andesite boulders on Lion Mountain that bear prominent N60°-N65°E grooves on their southwestern faces (Osburn et al. 1993: Figure 4; Weber 1994).

According to Bruier et al. (1992:21), "These dunes average 4–6 meters in height and represent coalesced ridges approximately a kilometer long and 80–120 m wide." Although these authors interpreted the Missile Range dunes as the transverse type (Bruier et al. 1992:21), they are considered to be the longitudinal type in the present study. Interspersed with the dunes are local areas of subdued relief underlain by sheet sands and, especially to the north, deflated tracts thinly veneered by sheet-washed alluvium. The dunes are now stabilized by grass and desert shrubs, a condition that appears to have persisted for a considerable period of time.

The source of the sands undoubtedly was from the Rio Grande at some time in the late Pleistocene, when the river may have been characterized by a broad, braided channel system. Some suggestion of the relative age of the dune field is indicated by the small, isolated lake basin north of the southwestern lobe of Lake Trinity, the long axis of which is parallel with the grain of the dune field. This strongly suggests a greater age for the dunes than the high stand of Lake Trinity. Neher and Bailey (1976:Sheets 1 and 3) mapped the dune field with the Onite-Bluepoint-Wink association (symbol OB).

**Lacustrine Sediments (Ql)**

Surficial deposits on the floor of Lake Trinity basin consist largely of clayey silts and silty clays. Gypsiferous silts and fine sands are widespread close to the northern and western margins. Granular granite wash (grus) is conspicuous near the southeastern
margin, where drainage from Precambrian rocks in the mountain front to the east discharge onto the lake floor. Local accumulations of gravel occur along the southern beach zone, where arroyo floods transport sediment down the bajada. The pink to red colors of much of the surficial deposits in the southwestern part of the basin reflect their derivation from Permian red beds in the mountains to the south. A thick sequence of red muds is well exposed in a borrow pit southwest of Marcial Site on the Salinas Peak NW quadrangle. This is a good illustration of the Marcial series of the Marcial-Ubar association (symbol MA) as mapped and described by Neher and Bailey (1976:16–17, Sheets 1 and 3). Sheet wash has resulted in a shallow but considerable redistribution of surficial sediments on the basin floor, and minor alluviation occurs along the margins. Although some material has been removed by deflation, relatively little surficial change has occurred since desiccation of the lake, except for the invasion of a grassland and desertshrub vegetation.

Only a few scattered borrow pits and dug wells reveal some details of the stratigraphy of the upper 1–3 m (3–10 ft) of the lacustrine sediments. The stratigraphy at depth, however, is shown in some detail by Neal et al. (1983:Figures 4 and 5) on the basis of four bore holes to depths of up to 40 m (131 ft) across the lake basin. These reveal a sequence of alternating sands, silts, clays, and gravels toward the margins, and a thick section of massive gypsum (CaSO₄·2H₂O) enclosing a .5-m (1½-ft) layer of hexahydrite (MgSO₄·6H₂O) near the center of the basin. Neal and others (1983:290) note, “The sedimentary/evaporite sequence shown in the Trinity basin suggests semipermanent, playa-lacustrine conditions different than currently exist, which is that of a playa that is rarely flooded.”

ARCHAEOLOGICAL STUDIES

Until recently, no large-scale, systematic surveys or excavations have been conducted in the vicinity of the remains of Pleistocene Lake Trinity. Prior to about 1985, surveys for WSMR installations had been conducted in the Tularosa Basin, but very few surveys had been conducted in the northern Jornada del Muerto. In the Trinity Basin, four large compliance surveys and management/planning surveys were conducted during the 1980s (Clifton 1988; Kirkpatrick 1986; Laumbach 1981; Seaman and Doleman 1988). Recent archaeological surveys and excavations (Browning 1993, 1994; Human Systems Research [HSR] 1991, 1992) have provided data that contributes to our understanding of the human occupation of Lake Trinity Basin.

Paleoindian

The human occupation of this area of the northern Jornada del Muerto has been documented back to 11,000 years B.P. (Weber 1973), based on survey and excavation data from the Mockingbird Gap Site. While no other Paleoindian sites have been excavated in this area, multicomponent sites with Paleoindian projectile points and other tools have been documented (Table 1). These multicomponent sites are either just below or above the upper shoreline. No single-component Paleoindian sites have been found. Some of the unknown lithic scatters may be Paleoindian sites without diagnostic points. It is likely that later Archaic and Formative peoples collected points and other tools from Paleoindian sites that they used and discarded on their own sites. Paleoindian...
<table>
<thead>
<tr>
<th>LA Number</th>
<th>Culture</th>
<th>Date*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic scatter</td>
</tr>
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<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic scatter, ground stone, cores, bifaces</td>
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<td>Late Archaic</td>
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<td>lithic scatter, ground stone, bifaces, cores, hammerstone, fire-cracked rock</td>
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<td>LA 101,219</td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic scatter, points, bifaces, cores</td>
</tr>
<tr>
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<td>Jornada Mogollon</td>
<td>A.D. 400–1400</td>
<td>lithic/sherd scatter, ground stone, point fragment, biface, core, brown wares, fire-cracked rocks</td>
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<td>LA 64477</td>
<td>Jornada Mogollon</td>
<td>A.D. 400–1400</td>
<td>lithic/sherd scatter, point, scraper, brown ware, fire-cracked rocks</td>
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<tr>
<td>LA 101,221</td>
<td>Jornada Mogollon</td>
<td>A.D. 750–1200</td>
<td>lithic/sherd scatter, ground stone, points, bifaces, cores, hearth</td>
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<td>A.D. 750–1200</td>
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</tr>
<tr>
<td>LA 81551</td>
<td>Unknown</td>
<td>Unknown</td>
<td>lithic scatter, ground stone, cores, bifaces</td>
</tr>
<tr>
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<td>Unknown</td>
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<td>A.D. 1912–1945</td>
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<td>lithic scatter, Plainview/Cody point, scraper, fire-cracked rock</td>
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<tr>
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<tr>
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<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic and sherd scatter</td>
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<td>Rio Abajo</td>
<td>A.D. 800–1680</td>
<td>can, glass, ceramic scatter</td>
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<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic/sherd scatter, ground stone, points, bifaces, cores, hearth, San Pedro and Hueco style points</td>
</tr>
<tr>
<td>Jornada Mogollon</td>
<td>A.D. 750–1200</td>
<td>brown wares and early and late style points</td>
<td></td>
</tr>
<tr>
<td>Euro-American</td>
<td>A.D. 1880s–1920</td>
<td>trash, hand dug well</td>
<td></td>
</tr>
</tbody>
</table>

* Default period dates used by Archaeological Records Management System
tools have been recovered only from multicomponent sites (Tables 1 and 2). These sites may represent choice locations since the Paleoindian or locations where Paleoindian tools were used by later peoples and discarded. Detailed studies of the lithic assemblages will be required to address these problems.

Today, both of these locations overlook the grassy plains of the Lake Trinity basin floor. During the wetter Paleoindian time, the lower elevations of the basin probably held water that attracted game animals. The water was probably too "strong" (full of sulfates) for human consumption but may not have been for animals. The area around the basin shorelines probably would have supported a variety of seasonably edible plants for grazing and foraging animals and human use.

*Archaic*

The Archaic period represented changing environmental conditions with an increasing trend to aridity. Plant and animal populations were adjusting to these conditions. The larger Pleistocene big game animals (e.g., mammoth, *Bison antiquus*) were extinct by this time, and the Archaic peoples hunted smaller game animals such as deer, antelope, and even rabbits. Plant resources, especially seeds, were important to the diet. During the Archaic, a new tool type was being developed. Ground stone tools, such as one-hand cobble manos and slab and basin metates, were used to process grass and other plant seeds. The Archaic peoples had a lithic technology that focused on bifacial core tools. Diagnostic projectile points or fragments are found on many sites, along with cores and whole and broken bifaces (Tables 1 and 2). Hammerstones are occasionally found. Tool manufacture and maintenance activities were conducted at these sites, along with processing plant seeds, especially from grasses. The presence of hearths and fire-cracked rock scatters is suggestive of special-use camps. The quality of available water may have prevented long-term camps. It is possible that potable water could have been obtained from springs in the nearby mountains and brought to camps in the basin.

The Early Archaic occupation appears to have been sparse. One site with a Jay/Bajada style dart point has been recorded. Like Paleoindian points, Early Archaic points occur only on multicomponent sites (Tables 1 and 2). The Middle and Late Archaic period sites are more common both above and just below the lake shoreline. San Jose, Shumla-like, and unnamed points with shouldered, straight, and some corner-notched hafting styles have been used to identify Middle Archaic sites. Late Archaic sites often have San Pedro and Hueco style points plus points with wide-based corner hafting style. Detailed descriptions of these points are presented in Browning (1993) and HSR (1991).

Many of the lithic-scatter sites lack diagnostic projectile points. These sites are similar in setting and artifact assemblage to the Archaic sites. The sites have ground-stone artifacts, cores and bifaces, and hearth-related features. It is very likely these are Archaic sites where the projectile points were collected for reuse by later prehistoric peoples or by modern artifact collectors. Detailed studies of the lithic assemblages, including material types, may help to determine the cultural affiliation of these sites. Based on the artifact assemblages, it is assumed these sites were also the result of hunting and plant-resource collecting and processing activities.
<table>
<thead>
<tr>
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<th>Culture</th>
<th>Date*</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
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<td>Late Archaic</td>
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<td>lithic scatter</td>
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<td>Late Archaic</td>
<td>1800 B.C.-A.D. 200</td>
<td>lithic scatter, ground stone, cores, bifaces</td>
</tr>
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<tr>
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<td>1800 B.C.-A.D. 200</td>
<td>lithic scatter, points, bifaces, cores, hearth, fire-cracked rock</td>
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<tr>
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<td>LA 101,215</td>
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<tr>
<td>LA 101,223</td>
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<tr>
<td>LA 101,231</td>
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<td>lithic scatter, points, cores, hearth</td>
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<td>lithic scatter, ground stone</td>
</tr>
<tr>
<td>LA 86482</td>
<td>Archaic</td>
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</tr>
<tr>
<td>LA 86483</td>
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<td>LA 81561</td>
<td>Rio Abajo</td>
<td>A.D. 800-1000</td>
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</tr>
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<td>Mogollon</td>
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<td>lithic and sherd scatter</td>
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<td>Jornada Mogollon</td>
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<td>lithic/sherd scatter, ground stone, points, bifaces, cores, hearth, fire-cracked rocks</td>
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<td>A.D. 200-1400</td>
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<td>Jornada Mogollon</td>
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<td>lithic/sherd scatter, bifaces, cores</td>
</tr>
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<td>Jornada Mogollon</td>
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</tr>
<tr>
<td>LA 101,237</td>
<td>Jornada Mogollon</td>
<td>A.D. 200-1400</td>
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</tr>
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Table 2. Cultural Affiliation of Sites Above Lake Trinity Shoreline at 1,431 m (4,695 ft) (cont.).

<table>
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<th>Date*</th>
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<td>U.S. Terr/State</td>
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<td>cans, glass, ceramic scatter, brass cap</td>
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<td>earthen stock tank, trash scatter</td>
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<td>Euro-American</td>
<td>A.D. 1880s-1912</td>
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<td>lithic/sherd scatter, ground stone, reworked San Jose point, biface, cores, hearth</td>
</tr>
<tr>
<td>Jornada Mogollon</td>
<td>A.D. 1100-1200</td>
<td>Playas Red (?), brown wares, shell pendent</td>
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<td>Paleolandian</td>
<td>9500-5500 B.C.</td>
<td>lithic scatter</td>
</tr>
<tr>
<td>Early Archaic</td>
<td>5500-3000 B.C.</td>
<td>lithic scatter</td>
<td></td>
</tr>
<tr>
<td>LA 81579</td>
<td>Late Archaic</td>
<td>1800 B.C.-A.D. 200</td>
<td>lithic scatter, sherd scatter</td>
</tr>
<tr>
<td>Rio Abajo</td>
<td>A.D. 800-1680</td>
<td>unknown</td>
<td>can, glass, ceramic scatter</td>
</tr>
<tr>
<td>Historic</td>
<td>Unknown</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>LA Number</td>
<td>Culture</td>
<td>Date*</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
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<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LA 89553</td>
<td>Middle Archaic</td>
<td>3000–1800 B.C.</td>
<td>lithic scatter, ground stone, bifaces, cores, fire-cracked rock,</td>
</tr>
<tr>
<td></td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>Shumla like point</td>
</tr>
<tr>
<td></td>
<td>Mogollon/Anasazi</td>
<td>A.D. 700–1300</td>
<td>lithic scatter, ground stone, San Pedro and Hueco style points</td>
</tr>
<tr>
<td>LA 89560</td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic scatter, ground stone, fire-cracked rock</td>
</tr>
<tr>
<td></td>
<td>Mogollon/Anasazi</td>
<td>A.D. 1150–1300</td>
<td>lithic and ceramic scatter, Jornada/Pitoche Brown ceramics</td>
</tr>
<tr>
<td>LA 89561</td>
<td>Paleoindian</td>
<td>6600–5500 B.C.</td>
<td>lithic scatter, bifaces, Plano points</td>
</tr>
<tr>
<td></td>
<td>Middle Archaic</td>
<td>3000–1500 B.C.</td>
<td>San Jose points, bifaces, ground stone, hammerstone</td>
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<tr>
<td></td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>Jornada Mogollon</td>
</tr>
<tr>
<td></td>
<td>Jornada Mogollon</td>
<td>A.D. 950–1100</td>
<td>Pitoche/Jornada Brown, San Andres Red-on-terracotta, hearth</td>
</tr>
<tr>
<td>LA 101,217</td>
<td>Unknown</td>
<td>A.D. 1890–1920</td>
<td>historic trash scatter</td>
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<tr>
<td></td>
<td>Euro-American</td>
<td>Unknown</td>
<td>lithic scatter, points, cores, hearth</td>
</tr>
<tr>
<td>LA 101,220</td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>lithic/sherd scatter, ground stone, points, bifaces, cores, hearth</td>
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<tr>
<td></td>
<td>Jornada Mogollon</td>
<td>A.D. 750–1200</td>
<td>San Pedro and Hueco style points</td>
</tr>
<tr>
<td></td>
<td>Euro-American</td>
<td>A.D. 1880s–1920</td>
<td>brown wares and early and late style points</td>
</tr>
<tr>
<td>LA 101,229</td>
<td>Late Archaic</td>
<td>1800 B.C.–A.D. 200</td>
<td>trash, hand-dug well</td>
</tr>
<tr>
<td></td>
<td>Jornada Mogollon</td>
<td>A.D. 200–1400</td>
<td>lithic/sherd scatter, ground stone, points, bifaces, cores, hearths</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>brown ware</td>
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* Default period dates used by Archaeological Records Management System
A lithic source study was conducted by Browning (1993:115-116) as part of an extensive survey and excavation project. Cherts—white, gray, black and green in color—are the most common material on the sites, regardless of cultural affiliation. The cores and associated flakes are from gravel- and cobble-sized rocks derived from Mississippian through Permian formations in the Fairview Mountains and the northern San Andres Mountains. Other lithic materials include chalcedony, rhyolite, siltstone, obsidian, and quartzite. Obsidian was obtained from either ancestral Rio Grande gravels in the basin or from the current river channel.

**Formative**

Formative occupation of this region is poorly known because of the lack of archaeological survey coverage. In general, the region is not suitable for agriculture because of the poor quality/quantity of water and absence of arable soil for growing crops of corn, beans, and squash. Both the water and soil are high in calcium carbonate and gypsum. This region is marginal to several well-recognized Formative cultures, specifically the Jornada Mogollon, the ancestral Piro, and the yet unnamed northern affiliation gray ware traditions noted by Peckham (1971) and by Ravesloot and Spoerl (1982). Most of the ceramic sites appear to have a Jornada Mogollon affiliation, based on the presence of Jornada/Pitoche Brown ceramics and rare occurrences of San Andres Red-on-terracotta and Playas Red sherds (Laumbach et al. 1991).

The Formative sites are similar in composition to Archaic sites. The sites contain scatters of flakes and brown ware sherds plus ground stone artifacts, cores, and hearth-related features. The ground-stone artifacts are one-hand cobbled manos and slab/basin metates commonly used to process wild grass seeds. Tool-manufacturing and maintenance activities are indicated by the presence of cores and general-purpose flake assemblages. The lithic source areas were the same as during the Archaic (Browning 1994). It is very likely that the Archaic sites were used as source areas by the later Formative peoples. Some of the sites thought to be multicomponent may actually be Formative, single-component sites consisting of lithic debitage collected from older Archaic sites, especially if the Archaic component is inferred from a single Archaic style point.

**Apache**

No sites were found in this area that can be associated with Apachean peoples. Mescalero Apache used the Oscura and San Andres Mountains and probably the northern Jornada del Muerto for hunting and gathering activities (Opler 1983: 419–420).

**Historic**

The historic use of the Lake Trinity Basin began in the late 1800s and continued into the mid 1900s. Homesteading for ranches was the primary reason for settlement in this region. Potable water was obtained from hand-dug wells, windmills, and cisterns that collected rain water. The Lake Trinity Basin grasslands were used by several individuals for grazing livestock, primarily cattle and horses. Fences in the Lake Trinity Basin are constructed of barbed wire strung on juniper posts. No evidence of sheep fences (e.g., gridded wire material) has been observed in the Trinity Basin. Sheep and goats were grazed in the
higher elevations of the Oscura and San Andres Mountains (Duran et al. 1990).

The headquarters of several ranches were located along the edge of the Trinity Basin. Water sources are important to ranchers who make their decisions on how to use open-range resources based on the availability of water. The ranchers built earthen tanks to capture the surface runoff from the nearby mountains (HSR Staff 1991). Several earthen tanks, notably Bole Russell Tank, Lewis Tank, and Anderson Tank, were constructed on the lake basin floor in locations that allowed the maximum collection of surface runoff from the alluvial fans and mountain fronts. The use of the basin-floor grasslands is limited by the fine-grained sediments (e.g., clay). Cattle, horses, and other livestock can get bogged down while grazing on the basin floor. During extremely wet periods, livestock was probably moved off the basin floor to graze on vegetation of the alluvial fans. Today, cars and trucks get stuck in the basin floor sediments during wet periods, especially during the summer rainy season of July through September.

**DATING OF LAKE TRINITY**

No geological age data have been obtained from the deposits of Lake Trinity. No faunal and floral fossils were encountered; indeed, the basin is conspicuously barren of recognizable fossil life forms, probably as a result of the inhospitable character of such a sulfate-rich environment. This is in marked contrast to the conditions that prevailed in and around the lakes on the Plains of San Agustín, where an abundant fauna of large and small mammals, birds, molluscs, ostracods, and a diatom flora were preserved (Weber 1994:11). Only meager evidence of a Pleistocene megafauna that includes mammoth and bison has been observed in the northern Jornada del Muerto at and in the general vicinity of the Mockingbird Gap Site. The paucity of remains there may, however, be the result of shallow depth of burial coupled with the chemically destructive effect of the gypsiferous soils on bone. Despite the absence of definitive age criteria, the degree of preservation of shoreline features indicates a late Pleistocene age for Lake Trinity, in common with other pluvial lakes in the region.

Archaeological dating of Lake Trinity shorelines is dependent on the interpretation of archaeological data from surface contexts. If the Paleoindian components (e.g., evidenced by the presence of dart points) on Sites LA 69434 and LA 81553 represent original occupations, and not recycling and reuse of points by later inhabitants, then the shoreline was below 1,428 m before 8000 B.C. Conversely, if the Archaic peoples reused these Paleoindian points, it is possible that the lake was higher until the Archaic, or about 5500 B.C. The presence of sites with diagnostic Archaic materials at or below the 1,428-m shoreline means that the lake level was lower at this later period and potentially higher during the Paleoindian times. Further analysis is needed of the artifact assemblages from these and other sites containing Paleoindian materials to identify specific cultural and temporal technological systems and to acquire chronometric dates from diagnostic features (e.g., hearths) on such sites.

**SUMMARY**

The Lake Trinity Basin has been occupied on a seasonal basis for over 11,000 years. Regionally, the nearby Mockingbird
Gap Site, and the local presence of Paleoindian dart points on sites document the use of this area by Paleoindian peoples. At that time, large game animals grazed the basin, to be hunted by early inhabitants of the area. Forests of oak, juniper, and piñon around the basin floor provided other food resources and materials for tools, clothing, and other items. Standing water in the lake was very probably too gypsiferous for human consumption throughout the history of the lake. During prehistoric times, potable water was probably brought to the sites from springs in the foothills of the nearby mountain ranges. Modern ranchers depended on wells, windmills, and rain water stored in cisterns.

With the increasingly arid conditions of the Late Holocene, the biotic communities shifted in response to available moisture. The woodland and forest communities retreated to higher elevations, and Chihuahuan Desert scrubland communities dominated the basin floor. The Archaic and late Formative peoples probably established seasonal camps along the basin to hunt deer, antelope, and small game animals. Grasses and shrubs would have provided seeds and berries for food. The lack of reliable surface runoff and good arable soils limited the use of the area for agricultural fields by the Mogollon and Anasazi peoples. No architectural sites, either seasonal field houses or more permanent pueblos, have been recorded in this remote section of the northern Jornada del Muerto. This region was probably viewed by Archaic and Formative peoples as a plant and animal food resource area and used on a periodic basis throughout the various seasons of the year.

Historic occupation of the area began in the late 1800s for grazing cattle, sheep, and horses on the grasslands of the lake floor. Ranches were established along the shoreline, between the coarser alluvial fan sediments and the fine, clayey lake-floor sediments. One of these ranches, the McDonald Brothers Ranch, served as the base camp (Camp Trinity) for the Manhattan Project field staff. The grasses, especially alkali sacaton, were important forage for the livestock. Early settlers built dirt tanks to capture and hold surface runoff water for livestock. Later ranchers built windmills and metal tanks on the lake floor to provide water for livestock.

Throughout time, this region of the Jornada del Muerto has been used by various peoples. This use, however, has been limited by the marginality of the resources, especially the water and soil. Future studies can focus on how prehistoric and historic peoples utilize marginal environments.

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Charcoal drawing by Bill Turney
The American Southwest has long held a great attraction for a variety of researchers—archaeologists, biologists, ethnographers, ethnohistorians, geographers, geologists, historians, and others. A vast literature has accumulated from this range of academic disciplines—covering from prehistoric times up to and including the present day.

There is considerable variation in interpreting the fascinating flow of the culture history of the prehistoric Anasazi Indians and the historic Pueblo Indian tribes. On the one hand, scholars have been impressed with the degree of cultural stability, or continuity, extending over centuries of prehistory and history. At the same time, there is widespread recognition of continual change—indicated by distinct cultural contrasts and variations that become readily evident with careful examination of the ethnographic data from the several tribal cultures.

In a very real sense, this is yet another example of the proverbial half-filled glass—half full or half empty? When comparing Anasazi/Puebloan culture history with that of neighboring non-Puebloan groups (the Athabaskan, the Ute, the Yuman, etc.), the Anasazi/Puebloan history takes on a relatively homogeneous character.

When considering Puebloan peoples as a unique cluster and looking internally, however, excluding the other Southwestern cultures, the Puebloans reveal a surprising range of heterogeneity that continues to intrigue specialists. It is not surprising that ongoing research only tends to reveal additional continuities and variations in traditional Puebloan norms.

While recognized and generally accepted, several examples of continuity and change combine to sustain interest among students of the Southwest. These examples include kiva architecture, linguistics, economics, ceremonies, etc. The existing roster of examples, however, should be considered as nothing more than a beginning, a preliminary assembling of data. Hopefully, discussions such as this present consideration will lead, in years to come, to listings of many more pieces of evidence; nonetheless, it is hardly conceivable that additional examples will ever significantly alter the nature of Puebloan culture history as we now know it—additional examples primarily can be expected to do no more than enrich the present scenario.
KIVA ARCHITECTURE

To begin with, a distinguishing feature shared by both the Anasazi and the Puebloan cultures has been the presence of population aggregates, or pueblos, which are the towns so designated by the Spaniards upon their initial contacts with these native peoples in the first half of the sixteenth century. In contrast are and were the small family camps and widely dispersed communities of the nomadic and seminomadic nonpuebloan tribes. (Walter W. Taylor’s [1964] paper regarding the Navaho and their tradition of “tethered nomadism” comes to mind in this regard.)

In these pueblos, both prehistoric and historic, a common feature has been, and continues to be, the kiva—rectangular or round, aboveground or underground, standing apart or enclosed in a block of rooms or houses. At present, the Eastern Pueblos have two kivas, except for Taos, where there are several. There are also several kivas at Acoma, Zuni, and in most of the Hopi villages—all in the west.

In archaeological sites near and around the Eastern Pueblos, there are often multiple kivas. Where existing Pueblo groups claim such pueblo ruins as being their ancestral sites, the Indians are nevertheless at a loss to explain the reason for the several kivas, when today they have only two. It may be that in former times, centuries ago, the extra kivas housed medicine societies or were associated with clan ceremonies—both explanations backed by present-day examples in the Western Pueblos. Enclosing these kivas in house blocks might also have originated in historic times as a device to conceal, or camouflage, the kivas from the eyes of the Spaniards, whose presence had a far greater impact on the Eastern Pueblos. The question remains unanswered!

Another kiva feature in the prehistoric east has to do with a unique fireplace assemblage in any number of kivas—specifically, several were encountered in the course of salvage excavations associated with the new dam on the Rio Grande just north of Cochiti Pueblo. When facing the fireplace, located in the southeastern quarter of the kiva, there is the firepit, the ash pit, the deflector, and the ventilator. This much is common, but in the Cochiti area, the raised rim of the firepit had a flattened, smooth stone on the right-hand side. This stone was a mano in a number of cases. Cochiti and Santo Domingo workmen claimed to have no knowledge of this particular feature—an element apparently so purposeless that it would seem to have had real significance. As yet, this remains a mystery!

LINGUISTICS

It has long been recognized that all human groups depend on at least one language, if not more. The Puebloan tribes are no exception. However, the variety of Puebloan languages does come as something of a surprise. This variety is, after all, merely a precursor, or reflection, of numerous additional differences among the several Anasazi/Puebloan groups. Rather than presenting a common, overall language, Puebloan cultures have several distinct tongues. This diversity is consistent with variations in other aspects of culture, as noted. In large part, the Puebloan languages remain distinct from the linguistic stocks of surrounding languages and tribal cultures.

Harry Hoijer (1946:10–23), in his discussion that has stood the test of time
with very little significant modification, summarizes his findings on the languages of the various Pueblo tribes. From time to time, consolidations of these languages into larger, more inclusive language groups have been suggested, but, for the most part, the basis for the changes has never been convincingly demonstrated.

Starting in the west and moving eastward are the Hopi Pueblos of northeastern Arizona. The Hopi Indians reside in a series of villages, or pueblos, located for the most part on three mesas, or potreros: on Third Mesa are Upper and Lower Moenkopi, Hotevilla, Bacabi, Old Oraibi, and Kyakotsmovi (New Oraibi); on Second Mesa are Shongopavi, Shipaulovi, Mishongnovi, and Toreva; and on First Mesa are Walpi, Sichomovi, Hano (or Hopi Tewa), and Polacca.

With the exception of Hano, where Tewa is spoken, all other Hopi Pueblo Indians speak Shoshonean, or Uto-Aztecan. While most people of Hano customarily speak Shoshonean, the Hopi Indian who also speaks Tewa is rare indeed.

All other speakers of Shoshonean are non-Puebloans, insofar as culture patterns and affiliations are concerned. The bulk of other Tewa-speaking Puebloans are in the Upper Rio Grande drainage of New Mexico, at the pueblos of San Juan, Santa Clara, San Ildefonso, Tesuque, Pojoaque, and Nambé.

Tewa is generally regarded as belonging to the Tanoan linguistic stock, which includes Tiwa and Towa speakers. In addition, as late as the early historic period, there were also Tano speakers—hence, the name of Hano, originally pronounced and spelled “Thano.” Tiwa components are Taos, Picuris, Sandia, and Isleta Pueblos. Today, Towa is spoken only at Jemez Pueblo, following the abandonment of Pecos Pueblo and the subsequent move of the remaining 30 or more Towa-speakers to Jemez Pueblo in 1838.

Other abandonments during the historic period include Awatobi, one of the Hopi-speaking villages (destroyed in the late 1690s by other Hopi, allegedly in order to rid their area of Christian influences; see Montgomery et al. [1949:18-24] for their account of this one-time important Hopi Pueblo).

In the Zuni area, in western New Mexico and just east of the Arizona line, the Pueblo of Hawikuh 18 km ([11 mi] southwest of present-day Zuni Pueblo) was abandoned at the time of the Pueblo Revolt in 1680. For most linguists, the Zuni language stands alone, despite some suggested affiliations with Kiowa, spoken by a southwestern Plains tribe.

Moving east from Zuni, the pueblos of Acoma and Laguna are Western Keresan speakers. The Eastern Keresan pueblos, in the Rio Grande and Jemez drainages, include Zia, Santa Ana, San Felipe, Santo Domingo, and Cochiti.

Though Acoma was in its present position when the first Spaniards came through the area, Laguna was founded by refugees from several Pueblo tribes in the late 1690s, after the Pueblo Revolt of 1680, making it the most recently established pueblo. Also, by virtue of its location near the Santa Fe Railroad line and old U.S. Highway 66 and its successor, Interstate 40, it is a highly acculturated tribe. In view of recent research, the pueblo was very likely built on the site of an earlier village.

A conservative faction from Laguna migrated in the early 1880s to the Tiwa
Pueblo of Isleta, on the Rio Grande south of Albuquerque, taking their kachina masks with them. These masks, the caretaker, and some 30 or 40 comrades were welcomed by the Isletans and given land in exchange for sharing the power of the kachinas, which the Laguna Indians promised never to remove. Until that time, it is generally believed that the Tiwa Pueblos had no kachinas, although they did and do have a number of secret societies, some of which involve curing.

Linguistically, the Salinas area, southeast from Albuquerque, was the home of Piro and Tompiro pueblos, Abq Quarai, and Tompiro. These were occupied villages in the early historic period, each with a mission church. The residents either died in the course of enemy raids or they fled south to the El Paso area at about the time of the Pueblo Revolt.

A number of large pueblos were occupied in the Galisteo Basin in the early historic period. These villages were also abandoned at the time of the Pueblo Revolt. Its people spoke Keresan, Tewa, and perhaps other languages.

**ECONOMICS**

These numerous Pueblos have all been agriculturally based. In the Salinas and Galisteo areas, this farming was, for the most part, dry or floodwater farming. Floodwater farming was also practiced in the Rio Grande drainage, but examples of rudimentary irrigation systems also occurred prior to the arrival of the Spaniards. The same combination occurred as far west as the Hopi villages where specially adapted species were frequently grown in fields placed in moisture-bearing sanddunes.

In pre-Spanish times, the principal crops were maize, beans, and pumpkins. Tobacco and cotton completed the list, but only in a few places.

With the arrival of the Spaniards, additional crops were introduced: wheat and other European grains, alfalfa, fruit trees, vineyards, and assorted vegetables.

Domestic animals—horses, mules, burros, cattle, oxen, goats, sheep, and chickens—were also introduced, in addition to the traditional dogs and turkeys. The Spanish also brought in metal items, primarily a variety of household utensils and equipment and agricultural tools.

These introductions significantly expanded the diet for both humans and animals and contributed to an overall improvement in the standard of living. At the same time, the non-Puebloan nomadic tribes increased their trading and raiding as they sought, one way or another, to share in these new items.

**SOCIOPOLITICAL AND RELIGIOUS PRACTICES**

Similarities and contrasts again are apparent in other aspects of pueblan culture: social relationships, political structure, and religious practices.

Puebloan social organization, for the most part, has been based on matrilineal kinship—exogamous clan structures. It can be hypothesized that this system prevailed in earlier, even prehistoric, times. Under the influence of the Catholic Church, there have also been endogamous marriages in cases where clan numbers have been sufficiently large to permit unions between distinct lineages within a clan. Such marriages have been embraced by the
Church when cousins are deemed sufficiently distant so as to eliminate any chance of incest—as defined by the Church.

The Tiwa pueblos, on the other hand, vary from the others by following patrilineal rules. Among the Keresan, Tewa, and Towa, kinship ties are patrilineal in terms of moieties, with dual divisions of each tribe. Again, these moieties are not found at pueblos such as Acoma, Zuni, and Hopi. As time passes, moieties, in a variety of ways, are displacing clans in importance.

Clan affiliation is permanent throughout a member’s life; by formal adoption rituals, however, a person (invariably a girl or woman) can shift clan membership. Moiety affiliation, in contrast, can be changed with the approval of the leadership of the two kivas. In time, as circumstances change, a kiva member can return to his or her original membership, again with the approval of both kiva leaderships.

Where moieties occur, they commonly have formed the bases for political and ceremonial activities. For example, at Cochiti, the Turquoise and Pumpkin kiva groups annually alternate the senior and junior (or assistant) offices of war captains, governors, and fiscales. Occasionally, these officials may be returned to office for a second year of service. After that, however, they must be allowed “to rest.” In most tribes, these officers serve without compensation other than the gratitude of the people, and their service is a considerable burden on the officer and his family. A few tribes, such as Santa Clara, have lived under a written constitution that provides for a minimum wage, or salary, for the year. Other constitutionally based tribes include Isleta and Laguna.

Most Pueblos however, continue to operate under traditional rules. In some Pueblos, individuals who have served in one of the major offices automatically become members of the tribal council; in other Pueblos, councilmen are elected for prescribed terms.

New laws and policies have been typically discussed and adopted by the councils according to common law. Following precedents, decisions are reached by the officers, or, in crucial instances, the matter is referred to the entire council. Such actions have traditionally been reached by unanimous agreement, a time-consuming practice. In more recent years, this process has been “modernized,” or speeded up—leading to decisions by majority vote.

Council membership is also changing—to include young men who, by some unique experiences, education, military service, or whatever, are invited to join in the council deliberations without ever having served as major officers.

Most Pueblos have a group of “assistants” to the major officers: alguacilitos or fiscales; these young men are observed, evaluated, and, on the basis of their performances, eventually may be named to serve in a major office. Since such community service is generally without compensation, there is some young men are inclined to “goof off,” showing themselves to be unreliable, negligent, or untrustworthy. Accordingly, they are passed over when new officers are selected and named.

To date, the recent governor of Isleta Pueblo is the sole example of a woman serving in this capacity. Despite opposition and bits of sabotage on the part of certain conservative members of the tribal council, this woman performed well and at the end
of her term continued to serve in the council. Other Pueblo women have aspired to serve in the governments of their tribes, but the Isleta case is the only known instance to date. More can be expected in the near future, but only in the tribes with constitutional political organizations. Tribes under traditional rules are governed by the medicine societies, and their policies have been focused exclusively on adult males.

Where Catholicism has brought changes in the social organization, Spanish civil authorities imposed offices such as the governors and fiscales upon the Pueblos. Caciques, war captains, and war chiefs continued, often by going underground and out of sight, as far as outsiders were concerned. In the west, away from prying Spanish eyes, the aboriginal practices continued, aside from the eventual acceptance of governorships.

Penalties and fines have frequently ceased to be effective deterrents. "Good" people, assigned to supervise the miscreant on some community work, such as ditch cleaning, are in a very real sense also punished. Traditional fines of $1.00 for failing to join the ditch-cleaning crew, for example, are willingly paid, to free the person for wage work in town, or wherever, at a considerably higher wage.

In religion, ceremonials and rituals have continued down through the years with remarkable faithfulness. In the east, where the influences of Catholicism have been strongest, the Feast Days of the Church have actually served to reinforce many ceremonies—the Mass is followed by a dance, most often the traditional Corn or Tablita Dance.

While the Tablita Dance is closely associated with Puebloan culture, there are a number of variations. It is an Eastern Pueblo custom, almost always linked to one or another Feast Day; the Tablita Dance is essentially absent among the Western Pueblos. A common element in these dances is the decorated pole—but only at some, but not all, Tablita Dances—even at the villages where it does appear in certain ceremonies. In other villages, it does not appear at all.

For most Pueblos, the alternate appearance of the moiety groups follows the practice of the Turquoise Kiva group dancing first, with the Pumpkin or Squash side second. This has been explained as being set by the order in which the people came up from the Underworld in the distant past. At Jemez Pueblo, however, the Pumpkin Kiva group regularly precedes the Turquoise. Elsewhere, the Pumpkins sometimes become impatient over the slow appearance of the Turquoise side and start their performance with no further delay!

In the Tablita Dances at the more conservative pueblos, the male dancers carry evergreen branches that have a "spiked" tip; seldom noted, this tip is symbolic of the male penis, as contrasted with the softer sprigs carried by the females, which represent the feminine vulvae. This symbolism illustrates the sexual nature of these ceremonials, along with the general purpose of fertility. Pueblos less bound by traditional values use the softer cluster of sprigs for both sexes, as these are more readily obtainable in the mountains.

Pueblos vary as to whether or not the female dancers perform barefoot. In the west, where acculturation has taken its toll, the males have been seen dancing in
bluejeans and shoes rather than in the traditional kilts and moccasins. Such costume improvisations there may result from a family’s failure to keep elements of ceremonial garb. In the east, a dancer would not be allowed to participate in any costume other than in the prescribed “uniform,” nor would a dancer desire to perform if a proper uniform was not available.

The Tablita Dancers are accompanied by a single large drum, usually but not always a product of Cochiti Pueblo. These drums are rotated or “rested” with each round of the dance. Cochiti drums are especially treasured, and while other tribes could make them, they seldom do so—except for the northern Tiwa Pueblos of Taos and Picuris. Other dances, such as the Animal or Hunting Dances, may use as many as six or eight drums simultaneously.

At the end of the day, after the dancing has concluded, the drums are generally laid down on their sides, in a row, and officials sprinkle them with cornmeal, thanking them for their voices.

During the dances, among the Tewa Pueblos, the drum is rested on a forked stick placed in the upper handle. This support makes it easier for the drummer. Among the Keres and at Jemez, however, drums are supported only by the hand in the upper handle—the Tewa support being disdained.

Dance steps and formations are sometimes altered or “jazzed up,” so to speak, as a gesture toward the young people for the purpose of retaining their interest and desire to participate. Participation in the dancing is highly valued in most Pueblos and in many families as a basic ingredient in the enculturation of their young people.

MODERN CHANGES

Kachina dances are still open to outsiders at Zuni and at Hopi, with occasional exceptions due to abuses and misbehavior on the part of some insensitive visitors—as, for example, a year-long ban at Zuni beginning with the Shalako ceremonies in the fall of 1995. Among the Eastern Pueblos, the Kachina dances are still closed, without exception, as are certain other secret ceremonies and rituals. This is a difficult matter to get a reading on, simply because these occasions are secret and closed to outsiders, making it difficult, if not impossible, to learn anything about either their occurrence or pertinent details.

As more young Pueblo men and women complete high school and often go on to institutions of higher learning, there is an increasing number of such people who qualify for employment outside the home village. It is also increasingly common for these individuals to meet and marry Indians from other tribes, as well as non-Indians. In cases where the couples have languages that are not mutually intelligible, English becomes the family language. The children tend to learn neither parent’s native tongue, not even the language of the parent in whose village they come to reside. As a number of Pueblo Indians have commented, “without our language, we lose our ceremonies, and without our ceremonies, we lose our culture.”

Where a tribal member brings a spouse to reside in his home village, the spouse, whether Indian or non-Indian, sometimes expresses an interest in joining in a ceremonial dance. Not all tribes allow this to occur, and even where it is permissible, there are tribal members who openly voice their disapproval. It is not encouraged!
Other subtle ceremonial changes are occurring. At Santo Domingo, for example, small dance groups formerly circulated from house to house on the night of Kings’ Day, January 6. The homes were those of newly appointed officers or of a Rey or Reyes. These dances have recently been discontinued, because the crowd of spectators that entered such homes to watch apparently included a number of individuals who stole items from the house. This would seem to be the result of the Pueblo becoming so large and impersonal that it is no longer the small, intimate community that it once was.

Similarly, the Gallo, the throwing of presents to the crowd from the roofs of homes of people celebrating a saint’s birthday, has been discontinued because some recipients fight over the tossed gifts—usually the result of drunkenness, often a part of the celebration of a Feast Day. This again would seem to be the result of a larger, more impersonal, population.

SUMMARY

There is an amazing adherence to the traditional culture patterns in the linguistic, economic, social, political, and ceremonial life in the various Pueblos. At the same time, there are constant innovations and changes in these patterns. In years past, this contest between tradition and modernization has created problems for the various tribes and the Pueblo Indians. Individuals have often resorted to alcoholism and other solutions to these conflicts. In recent years, however, increasing percentages of the people have found a way to select aspects of both cultures, embracing the traditional ways and still participating in mainstream American culture.

As Joe S. Sando (1979:429), a Jemez Indian, wrote in his article specifically on his home pueblo in the Southwest volume of the Handbook of North American Indians:

As the younger generation masters White culture and adapts to its ways, they also appear to want to learn and to understand more of their own heritage. Thus, the proverbial American melting pot does not seem to affect the Jemez. They want to maintain and live their culture but use the tools of the technological society of their neighbors. It would be safe to predict that the Jemez will remain tribal people for a few more generations, judging from their respect for traditional ways, the living language, and their choice of the best from two viable cultures, the Pueblo and the general American.

—Santa Fe

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EXPANDING ATHABASKAN CHRONOMETRIC BOUNDARIES IN WEST-CENTRAL NEW MEXICO

Yvonne R. Oakes

Early Spanish documents chronicle 1500s Athabaskan or nomadic presence for almost all mountainous areas of New Mexico. While early Spanish explorers encountered these people on almost every expedition into the New Mexico hinterlands and noted numerous rancherias and tepee villages, few documented Athabaskan sites exist in the archaeological record. Most early sites have been found in northwestern New Mexico and generally consist of isolated, collapsed forked-stick hogans and/or associated Navajo ceramics. Dates for the earliest of these are currently estimated as early as the mid-1400s (Brugge 1992:337; Hancock 1992:287). In southwestern New Mexico and eastern Arizona, Athabaskan remains consist of 1800s wickiups, ramadas, windbreaks, rock shelters, and stone-ringed fortifications (Donaldson and Welch 1991:94–99). The authors (1991:100) comment that there is no unequivocal evidence for Apache occupation of the west-central Mogollon Highlands prior to 1800. However, Opler (1983:382) believes that these Western Apache may have reasonably been in the Southwest as early as 1400.

So why have only a handful of earlier Athabaskan sites been recorded within the entire state? Certainly, archaeological visibility of Athabaskan sites is minimal. Wood-pole or brush structures are highly impermanent; Athabaskan pottery is of limited manufacture; and lithic artifacts are currently nondiagnostic and considered basically indistinguishable from Archaic scatters. Perhaps, given the historic mobility of Athabaskan groups and the impermanence of their structures, it is understandable why so few sites have been recorded.

But, is this state of Athabaskan archaeology acceptable today? Is it possible to compensate for the low-visibility problem and improve New Mexico Athabaskan site frequencies? Current archaeological survey methodology will never be able to identify those Athabaskan sites that lack surficial structural remains or diagnostic pottery. It is these low-visibility, nondiagnostic, minimal artifact density sites—Athabaskan or otherwise—that frequently are bypassed when formulating data-recovery programs that focus on the larger, structural sites for excavation. Yet, only through excavation of these minimal-artifact, nondiagnostic, or isolated hearth/burn areas will many Athabaskan sites be found. Often, probing, testing, or excavation of these types of sites can yield subsurface datable materials or diagnostic artifacts that will allow for identification.
ATHABASKAN SITES
NEAR RESERVE

The benefits of testing or excavation in identifying Athabaskan sites were clearly made during recent excavations conducted by the Museum of New Mexico, Office of Archaeological Studies, in the mountainous region of west-central New Mexico near Reserve and Datil. Several Athabaskan sites were recorded during investigations for the New Mexico State Highway and Transportation Department within the Gila and Cibola National Forests, through the excavation of small lithic scatters. Journals from Spanish military and exploratory campaigns in southwestern New Mexico and eastern Arizona suggest Athabaskan groups were fairly common in the area. A few recordings are documented in Table 1.

From this documentation, it is obvious that Athabaskan were frequently sighted in the vast mountains of southwest New Mexico, eastern Arizona, and Mexico from at least the early 1500s to about 1900. But where are the archaeological sites that substantiate the written record? To date, only a few sites have been documented. A hearth containing Athabaskan Utility sherds produced a radiocarbon date of $390 \pm 90$ B.P. near Quemado (Oakes 1986). An Athabaskan olla was recovered from Delgado Cave near Reserve, and Utility sherds were found on the surface at Y Canyon Cave (Martin et al. 1954:70). Two sites with small, circular, stone rings and plain brown ware were recorded near Devil’s Park (Peterson 1988:114). At the Burned Dune site in southeastern Arizona near the Picacho Mountains, a fire pit yielded a $^{14}C$ date of $460 \pm 40$ B. P. (Bayhem and Morris 1990:31). These seem to be all of the known Athabaskan sites in the region, particularly for the mountains of west-central New Mexico. This type of site has been truly archaeologically invisible!

OAS excavated 25 sites along U.S. Highway 180 and State Road 12 near Reserve in Catron County; prior to field work, five of these sites were thought to be Archaic because of the extent of lithic artifacts present. Some of the excavated sites had large, corner-notched projectile points. After excavation, it was found that two of the five sites were Archaic, two were Athabaskan, and one had both Archaic and Athabaskan components, based on radiocarbon dating. Two other later Mogollon sites also had evidence of Athabaskan reuse.

Table 1. Observations Made of Apache in Southwestern New Mexico and Eastern Arizona.

<table>
<thead>
<tr>
<th>Year</th>
<th>Observation</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>1400</td>
<td>San Carlos Apache say had contact with Pueblo Indians at Dewey Flat on Gila River in Arizona</td>
<td>Forbes 1960:xviii</td>
</tr>
<tr>
<td>1537</td>
<td>Fray Marcos mentions a <em>despoblado</em> at San Pedro, Arizona</td>
<td>Danson 1957:112</td>
</tr>
<tr>
<td>1540</td>
<td>Coronado probably saw what were Apache in the Mogollon Mountains living in rancherias</td>
<td>Riley 1985:160</td>
</tr>
<tr>
<td>1581</td>
<td>Apache seen heading for Piro Pueblo near San Marcial</td>
<td>Hammond and Rey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1928:286</td>
</tr>
<tr>
<td>1583</td>
<td>Espejo saw “Mountain” Querecho near Acoma</td>
<td>Opler 1983:384</td>
</tr>
<tr>
<td>Year</td>
<td>Observation</td>
<td>Reference</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>1598</td>
<td>First use of the word “Apache”</td>
<td>Hammond and Rey 1953:345</td>
</tr>
<tr>
<td>1610</td>
<td>Apache or Navajo near Lower Chaco River</td>
<td>Eschman 1983:384</td>
</tr>
<tr>
<td>1620</td>
<td>Benavides says Apache de Xila living in pueblo 14 leagues west of Piro Pueblos near Socorro</td>
<td>Hodge et al. 1945:82</td>
</tr>
<tr>
<td>1634</td>
<td>Benavides describes pueblos surrounded on all sides by huge Apache Nation</td>
<td>Ayer 1916:39</td>
</tr>
<tr>
<td>1640</td>
<td>Apache as far west as Zuni</td>
<td>Schroeder 1963:7</td>
</tr>
<tr>
<td>1666</td>
<td>Spanish campaign against Apache near Acoma</td>
<td>Schroeder 1963:7</td>
</tr>
<tr>
<td>1672</td>
<td>Bancroft states conflict between Spanish and Apache began at about this time</td>
<td>Thrapp 1967:7</td>
</tr>
<tr>
<td>1680</td>
<td>Father Kino mentions Apache trading with Zuni</td>
<td>Danson 1957:112</td>
</tr>
<tr>
<td>1681</td>
<td>Apache camped near Piro Pueblo of Senecu</td>
<td>Hackett and Shelby 1942:203</td>
</tr>
<tr>
<td>1692</td>
<td>First mention of Warm Springs Apache</td>
<td>Buskirk 1949</td>
</tr>
<tr>
<td>1747</td>
<td>Revillagigedo military campaign to rid area west of Rio Grande of Apache</td>
<td>Kessell 1971:136</td>
</tr>
<tr>
<td>1756</td>
<td>Mexican and Spanish soldiers met in Cliff area to track Apache</td>
<td>Kessell 1971:131</td>
</tr>
<tr>
<td>1785</td>
<td>Spanish expedition by Cordero to hunt Apache near Cliff</td>
<td>Kessell 1971:149</td>
</tr>
<tr>
<td>1835</td>
<td>Authorities in Sonora, Mexico, offer 100 pesos for each Apache scalp</td>
<td>Thrapp 1967:10</td>
</tr>
<tr>
<td>1864</td>
<td>Apache noted near Fort West on Gila River</td>
<td>McFarland 1974:13</td>
</tr>
<tr>
<td>1875</td>
<td>Apache chase Mexican settlers near Luna</td>
<td>Hough 1907:58</td>
</tr>
<tr>
<td>1879</td>
<td>Apache in mountains south from Zuni to Silver City</td>
<td>Green 1990:84</td>
</tr>
<tr>
<td>1885</td>
<td>Apache in Gila Mountains killed prospector</td>
<td>McFarland 1974:8</td>
</tr>
<tr>
<td>1900</td>
<td>Apache at head of Mogollon Creek</td>
<td>McFarland 1974:56</td>
</tr>
</tbody>
</table>
The five Athabaskan sites are briefly described below along with their radiocarbon dates. All dates are from wood charcoal samples and are shown at one sigma with all calculations computed by Beta Analytic, Inc.

Rocky Hill (LA 37917) is an extensive lithic artifact scatter. It produced a pooled date of cal. A.D. 1520 ± 62 from two subsurface burn areas with concentrations of lithic materials in the east and middle portions of the site. One corrected ¹⁴C date is 300 ± 130 B.P. (Beta 57450), with calibrated ranges of A.D. 1440–1670 and A.D. 1780–1790 and only minimal representation in the later range; the other corrected date is 460 ± 70 B.P. (Beta 64061), with a calibrated range of cal A.D. 1420–1480. The west edge of the site yielded a corrected date of 120 ± 100 B.P. (Beta 57449), with a calibrated range of A.D. 1670–1950. This is a later occupation than displayed on the rest of the site, but because of the association lithic material nearby, is still likely to be a Late Athapaskan date. No historic artifacts were present.

Apache Woods (LA 37919) is an extensive lithic artifact scatter. A subsurface burn area produced a statistically pooled date of cal. A.D. 1450 ± 75. One corrected date is 510 ± 110 B.P. (Beta 64062), with calibrated ranges of A.D. 1320–1350 and A.D. 1390–1470. The earlier calibrated range is minimally represented. The other corrected date from the site is 380 ± 90 B.P. (Beta 57451), with a calibrated range of A.D. 1440–1650. A Chiricahua-like projectile point was also recovered.

Raven’s Roost (LA 70188) is mainly a Late Archaic campsite; however, overlying several small, dated Archaic pit structures is a layer with three dates in the 1700s and early 1800s. One corrected date is 200 ± 80 B.P. (Beta 64066), with calibrated ranges of A.D. 1640–1690 and A.D. 1730–1810. A second corrected date is 160 ± 90 B.P. (Beta 69808), with a calibrated range of A.D. 1660–1950. The third corrected date is 140 ± 60 B.P. (Beta 78271), with calibrated ranges of A.D. 1670–1780 and A.D. 1795–1945.

A nearby pit produced charcoal-filled soil with a corrected date of 500 ± 50 B.P. (Beta 64067), yielding a calibrated range of A.D. 1400–1470. A burned area (with lithic artifacts) to the west of this concentration yielded a statistically similar corrected date of 580 ± 100 B.P. (Beta 69811), and a calibrated range of A.D. 1300–1430. Therefore, it appears that the site also has an earlier 1400s occupation.

Lightning Strike (LA 70189) is the location of a Reserve phase roomblock, dating circa A.D. 1000. A nearby charcoal and stone-filled roasting pit produced a corrected ¹⁴C date of 340 ± B.P. (Beta 57459), with a calibrated range of A.D. 1460–1650.

Ladybug Junction (LA 75791) is a Pithouse phase site with dates in the A.D. 600–800s. However, a very shallow pit structure (Figure 1) produced a corrected date of 300 ± 60 B.P. (Beta 57466), with calibrated ranges of A.D. 1510–1600 and A.D. 1620–1660. A roasting pit yielded a corrected date of 250 ± 70 B.P. (Beta 57467), with calibrated ranges of A.D. 1530–1550, A.D. 1640–1680, and A.D. 1770–1800. The earliest range is a minimal representation. Three small, eroded, basin-shaped hearths adjacent to the shallow pit structure (Figure 2) yielded an Athabaskan Utility sherd but no dates. These are probably associated with the pit structure.
Figure 1. Apache roasting pit at Ladybug Junction.

Figure 2. Eroded Apache hearths at Ladybug Junction.
Identification was made of these five sites as Athabaskan on the basis of 13 radiocarbon samples recovered from subsurface features and an Athabaskan sherd. The 13 corrected dates, in summary, are A.D. 1370, 1440, 1450, 1490, 1570, 1610, 1620, 1650, 1700, 1730, 1790, 1810, and 1830, spanning a period of 440 years. Through excavation, we uncovered probable Athabaskan hearths, roasting pits, shallow pit structures (possibly depressed floors), burned areas, and the Athabaskan sherd.

A comment on the lithic artifacts recovered from the five sites is in order. All of the artifacts are generally indistinguishable from similar debitage found on nearby Archaic sites in terms of quality and choice of raw materials, workmanship, and projectile-point typology. Most points are strikingly similar to Archaic styles, including the Chiricahua point from the Apache Woods site. No definite Apache-type projectile point was identified. Ferg and Kessel (1987:50) comment that the Apache frequently scavenged points of "various ages and cultural affinities from prehistoric sites." They describe Apache-made points as crude and barely symmetrical.

All five sites are located either in the high valleys or adjacent lower foothills of the mountainous Mogollon Highlands at elevations ranging from 1,882 to 2,048 m (6,175–6,720 ft). Three are on adjoining finger ridges in areas of dense shrub oak, piñon, and juniper overlooking the expansive Pine Lawn Valley.

ATHABASKAN SITES NEAR DATIL

In 1994, we excavated three artifact scatters of unknown cultural affiliation in White House Canyon, within the Datil Mountains on the northern border of the Mogollon region (Hayden et al. 1996). Like the Reserve area, the region is rich in wild game and laced with small valleys separated by hills covered in oak, piñon, and juniper. One of the sites may be Early to Middle Archaic, but this is based on a single $^{14}$C sample with a corrected and calibrated date of 7020 B.C., which must be viewed with great caution.

One artifact scatter, Dust Devil Hill (LA 104381), has a dated Mogollon component. But it also contains the subsurface, charcoal-blackened outline of a probable brush structure with an associated hearth that contained 175 sherds from several vessels identified as Athabaskan Thin Utility.

All are relatively wide-rimmed jars probably used for cooking. The volcanic temper suggests the vessels may have been locally made (Dean Wilson, personal communication 1995). The charcoal from the nearby burned area produced a corrected $^{14}$C date of 340 ± 110 B.P. (Beta 77841), with a calibrated range of A.D. 1445–1665.

The other site, Elk Grossing (LA 39998), was also a multicomponent locus with Late Archaic, Mogollon, and again, a charcoal stain with a $^{13}$C corrected date of 360 ± 60 B.P. (Beta 77833), with a calibrated range of A.D. 1455–1640. A small activity area on the site produced 26 Athabaskan Utility sherds from at least 5 vessels, all probably jars. Also in this area were 22 ceramics from at least 3 vessels, mostly bowls, which are representative of the Piro Pueblos near Magdalena and Socorro, 96 km (60 mi) to the east.

The Piro Pueblos are known to have traded with Apache tribes in the
Protohistoric period and to have traveled west into the surrounding mountains to hunt. Hough (1907) recorded a six-room cliff dwelling only several kilometers from Dust Devil Hill, which he says had pottery like that of Magdalena and Socorro. In light of this finding, perhaps there were actually small enclaves of Piro peoples living in or utilizing the Datil Mountains.

By the 1620s, Hodge and others (1945:82) state that enmity had developed between the Apache and Piro, and by the late 1660s, the Piros had suffered more than most pueblos from Apache attacks (Scholes 1930:400). As Spanish control over the New Mexico Pueblo Indians increased, trade between the Apache and the pueblos vastly decreased and Apache raiding increased (Garner 1970:26-27). The Piro Pueblos were abandoned by 1680, therefore two $^{14}$C dates from Dust Devil and Elk Crossing sites in the late 1500s and early 1600s is perfectly compatible with known Piro-Apache relationships at that time. The Elk Crossing site could represent an Apache occupation with Piro trade wares obtained from excursions into Piro territory or a Piro hunting trip into the Datil Mountains. The presence of Athabaskan sherds on the site would tend to favor the former explanation.

CONCLUSIONS

The excavation of the small campsites in the Datil Mountains and the Mogollon Highlands have proved to be significant for several reasons. The obvious one is to never underestimate the potential of a small artifact scatter. On all of these sites, the presence of subsurface datable materials was virtually a necessity for identifying Athabaskan sites unless they happened to have the distinctive ceramic wares. More important for west-central New Mexico, this is the first archaeological verification of an Athabaskan presence in the Datil Mountains prior to the late 1800s and in the Mogollon Highlands from approximately A.D. 1400–1500. Also, the occurrence of Athabaskan Utility sherds presumably dating to the late 1500s and early 1600s should give us cause to reevaluate our dates for the beginnings of Athabaskan pottery. Until recently, archaeologists have believed that ceramics were not present in Athabaskan assemblages until after the Pueblo Revolt in the late 1600s (Baugh and Eddy 1987; Brugge 1982). However, Navajo sites from northwestern New Mexico may also have ceramics that were produced as early as the 1500s (Brown and Hancock 1992; Reed and Reed 1992).

The discovery of five Athabaskan sites within the narrow ribbon of highway right-of-way in the foothills of the Mogollon Highlands suggests that many more such sites are likely to be present. The range of $^{14}$C dates for these sites, from the early 1400s to the early 1800s, indicates an early and long history of occupation for Athabaskan peoples in west-central New Mexico.

—Office of Archaeological Studies, Santa Fe

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Bill was a professional civil engineer and owned an engineering firm in Santa Fe, William F. Turney Associates. Bill, however, was interested in avocation Southwest archaeology, especially mapping and surveying of sites. These sites consisted, mainly, of prehistoric sites in northeastern New Mexico and Casas Grandes, Mexico.

Bill and his wife, Mary, spent many weekends and vacations measuring with Bill sketching many 8-½ by 11-inch sheets of individual sites, making simple, concise scale plates. These measured drawings were very useful to those who gave archaeological lectures to crews at the Vidal Site ("Great Kiva") near Gallup, New Mexico, and for the Ghost Ranch Seminars at the Dr. Florence Hawley Ellis Museum, which included surveying and mapping of the Gallina area, Rattlesnake Ridge, and later sites on Ghost Ranch.

In the 1980s Bill gave me a set of transparent sheets to be used to help teach archaeology students at Ghost Ranch and the Vidal site in the basic skills of surveying and plane-table work. This set of 30 sheets (10 drawn by Bill; Figure 1) illustrated scale plates to inform students of sites that they would excavate.

Bill obviously was interested in archaeology and water-control at an early age, as he noted of his Boy Scouting period, "I first visited the Mormon Colonies in Boy Scouting. We rode horseback some 10 miles into the Sierra Madres. There were stone check dams fifteen feet high along the entire watershed. I believe this water control as only on the river serving the Casas Grandes area. Casas Grandes proper brought their water from a spring which was thermal."

—Albuquerque
Figure 1. Sample teaching aid of Casas Grandes prepared by Bill Turney.
THE SOUTH HOUSE AT PUYÉ REEXAMINED

Stewart Peckham

In 1906, Edgar Lee Hewett inaugurated an ambitious, multidisciplinary research project on the Pajarito Plateau involving studies in archaeology, ethnology, linguistics, geography, botany, and zoology. The archaeology was to be the springboard to study the culture of the Tewa pueblos and their relation to the distinctive environment of the Pajarito Plateau and the Tewa Basin. In 1907 and 1909, as part of this grand plan, he directed excavations at what he called the Acropolis—the great Community House at Puyé. Accounts of his excavations were general (Hewett 1953) and did not contain the descriptive details that academic archaeologists were beginning to become interested in and use for teaching at universities in the East. Instead, he was more visionary and sought to stimulate public interest in the archaeology of the Pajarito Plateau and the greater Southwest through museum exhibits, lectures, and archaeological field schools.

During the first two seasons of excavation at Puyé, 1907 and 1909, among Hewett’s field assistants were two Harvard graduate students, Sylvanus Griswold Morley and Alfred Vincent Kidder, and one from Columbia University, D. D. Streeter, Jr. Sylvanus Morley had graduated with an engineering degree from Pennsylvania Military Academy, and his excellent field notes reveal a concern for detail one might expect of an engineer. Morley (1910) published a concise paper (Hewett 1938) that described the excavated features of the South House at Puyé, but at that early date he had little other comparative data to refer to, and Puyé archaeology could advance very little. Almost 40 years later, Morley succeeded his early mentor as Director of the Museum of New Mexico and the School of American Research, and on Morley’s death in 1948, he bequeathed his library to the Museum of New Mexico. I encountered part of this collection in a vault at the Laboratory of Anthropology, including Morley’s field journals on Puyé, and those of Streeter. Reportedly, Hewett had destroyed many of his journals, and there seemed little hope that more data on Puyé would come to light. Then, in 1995, Frances Joan Mathien of the National Park Service called my attention to the existence of later Puyé excavation notes—those of Hewett and A. V. Kidder—in the Hewett Papers on file at the Museum of New Mexico’s History Library. Though not as detailed as those of Morley, their notes helped to fill in gaps concerning the early Puyé excavations. This paper is based primarily on Morley’s notes.
Artifacts and some data from the South House fieldwork were ultimately deposited in the collections of the U.S. National Museum, the Peabody Museum at Harvard, the San Diego Museum of Man, and the Museum of New Mexico. For many years, some artifacts were exhibited in what was called the Puye Room at the Museum of New Mexico's Palace of the Governors.

THE SITE

Though listed under one site catalog number, LA 47, Puye is really a complex of sites located on lands of the Pueblo of Santa Clara, 13.7 km (8.5 mi) west of that pueblo. The largest of the sites—what Edgar L. Hewett often called the Acropolis or Great Community House—occupies part of the top of an isolated, almost vertical-sided mesa of Bandelier tuff. Approximately 1,750 m long and from 25 to 210 m wide, the mesa rises over 60 m above an extensive flat to rolling area to the south. At an elevation of about 2,100 m, mixed piñon-juniper woodland and ponderosa pine prevail in these areas. North of Puye, in Santa Clara Canyon, Douglas fir and ponderosa pine are more common. A short distance southeast of Puye, the vegetation changes to a mixture of piñon-juniper and open prairie.

About 30 m west of the Community House, exposed on the ground surface, are walls of unknown date, and farther west, at least three smaller Coalition period sites are situated on the sandy sterile soil of gradually increasing depth that caps the highest parts of the mesa. East of the Community House, where the mesa narrows, soil erosion has exposed the top of the massive Bandelier tuff, a soft though consolidated volcanic ash deposit. Along the south edge of the mesa, the bedrock is totally bare, and its somewhat tabular layers were extensively quarried for construction of the Community House.

At the south edge of the mesa, five irregular but intentionally cut stairways lead downward to two ledges, about 10 and 20 m below the mesa top, on which are many small, single- and multistory open sites. Also, cavate sites were constructed into the ledges. On the north side of the mesa, six other stairways lead down to trails to a few cavate rooms, a spring, and the permanently running stream in Santa Clara Canyon, as well as to the ruin of Shufinné—a Coalition and Classic period complex on the uplands north of the canyon. Farther south, many additional open and cavate sites occupy the margins of Garcia Canyon and other drainages flowing eastward from the mountains.

A sketch map of Puye drawn by a government surveyor, William Boone Douglass, shows the presence of at least three subterranean kiva depressions outside the Community House quadrangle (Figure 1). At least one of these kivas, Kiva F, was excavated and restored. Though no excavation data have survived, it is circular, 6.1 m east-west in diameter, and cut deeply into bedrock. It has a ventilator to the east and an entry to the west, which has been sealed (possibly recently). Today, the kiva has a bench encircling its interior; possibly part of the modern restoration, it is not a normal feature in prehistoric Rio Grande kivas. There are no data describing the other two mesa-top kivas, Kivas E and G.

ARCHITECTURE

The Puyé Community House is a large, plaza-type pueblo of masonry-walled surface rooms in the shape of a rectilinear O. The plaza enclosed by the rooms appears to be
Figure 1. Sketch map of Puyé, 1907 (after drawing by William Boone Douglass).
featureless. Blocks of rooms on each side of the central plaza were given directional designations: North House, West House, South House, and East House. Detailed data have been found only for the South House excavations of 1907 and 1909, though Hewett also directed excavations in 1916 and 1926, exposing about 100 additional rooms each in East House and West House. No record of those excavations has yet been found.

Totally separate from the other house blocks enclosing the plaza, the South House was a systematically constructed block of 173 ground-floor rooms arranged in 14 north-south rows, which the excavators designated alphabetically from west to east (Figure 2). The rooms in each row were also numbered from north to south, sometimes beginning inside a room, though in a few cases beginning outside the northern-most room in the row. Although the numbers run continuously from 1 (on the north) to as high as 12 in a row, wall abutments show that each row was further divided into 2 contiguous suites: each north one having 5 to 6 rooms fronting on the plaza on the north side, and south suites, fronting along the cliff side, have 4 to 5 rooms. Except for Rooms D6 and F6, none of these pairs of suites were connected by doorways at ground level.

Although the ruin has undergone some stabilization, most wall alignments and abutments are preserved near their lowest courses. Some walls were surprisingly intact much higher, in spite of 75 years of weathering. From the abutments it is possible to show the approximate increments of construction, though they do not show the rate of growth (Figure 3). With a possible lifespan of over 200 years, the South House conceivably could have been built and repaired at intervals throughout part or all of this period. On the other hand, the wall abutment sequence and alignment of suites suggest that a preconceived construction plan was being followed and that the stages reflect periods when the builders were simply allowing adobe mortar to set or were accumulating enough additional building materials and water to permit resumption of construction.

The construction stages show that the first suites of rooms to be built were those that fronted the plaza on the north (Stages 1 through 4); doorways penetrated the back (south) walls of only two rooms (D6 and F6), and one of these doors was eventually blocked (Figure 3). Subsequently added were three large blocks of rooms that fronted the south side of the South House (Stages 5 and 6). At the east end of the South House are a cluster of 16–23 rooms (Rows O through R); their long axes are at a right angle to the axes of rooms in Rows A through N. A number of these eastern rooms and some at the west end were built on trashy fill, with at least the eastern group appearing to have been added after initial construction, possibly during the reoccupation of the pueblo in the 1520s. Most cross walls in the middle rooms of Row K had collapsed, possibly creating another passageway between the plaza and the suites of rooms on the south side.

As it is seen today, all the rooms in a given row appear to have been connected by doorways. Such was definitely neither the case prehistorically nor when the ruin was excavated—as the field notes showed. Apparently the present-day gaps in the walls are the result of wear and tear brought about by modern visitors.
Figure 2. Plan of the South House at Puyé.
Figure 3. Approximate construction sequence of the South House, based on wall-abutment analysis.
ROOM FEATURES

Although there was considerable variation in room size, the average was about 7 sq m. Excluding doors and vents, 60 percent of the South House rooms had no interior features; in other words, they lacked hearths, windscreens, sleeping ridges, and alcoves. Many of these were the innermost rooms of the roomblock, but others were the outer rooms. Eleven of the long, rectangular rooms had been further divided into two smaller rooms by walls—perhaps for some specialized storage. One room had a three-part bin, but no mealing bins were found.

It is presumed that most of the inner rooms would have been for storage or for sleeping rooms for children and guests. Although there could be exceptions, it would appear that there could be from one-quarter to one-third as many second-floor rooms as rooms on the ground floor. With 173 ground-floor rooms in the South House, this would suggest that there might have been as many as 50 second-story rooms, totaling about 223 rooms for the houseblock. Upper-story rooms and roof tops might have been more desirable sleeping areas in the summer.

Hearth

With a few exceptions, hearths were most common in the outer two or three rooms of a suite—rarely in the outermost rooms—and located against the wall on the side toward the outer or front side of the suite and close to a doorway (Figure 4a). Hearths were longer than wide and usually had rounded ends. Many hearths were equipped with “tripods” formed by somewhat cylindrical stones set vertically against the front and back edges of the hearth and rising about 25 cm above the floor level—two in front and one in back. Presumably they supported flat sandstone slabs (comales) on which tortillalike bread could be cooked. Harrington (1916:234) cites a Santa Clara place-name of a “sunny place of the stone for baking bread”—a sandstone outcrop about 5 km west of Puye. No whole cooking stones were found during the excavations. A good cooking stone is still a prized possession, and good ones from Puye were probably salvaged when its last inhabitants moved to Santa Clara Pueblo.

With a draft of fresh air entering the room through the door, a short masonry wall was often constructed between the hearth and the door to serve as a wind screen or deflector. In most cases, the plastered walls of rooms with hearths were smoked or blackened with soot from the cooking and heating fire (Figure 4b). Internal doorways or vents caused smoke-laden air currents to circulate into some inner rooms, so that even rooms without hearths sometimes show smoking. However, the occupants of Puye were certainly aware of the principles of air ventilation and encouraged the passage of fresh air into interior rooms through numerous small vents in room walls. Hatchways in the roof would permit smoke to escape to the outside unless there were upper-story rooms. Thus, the absence of smoking on the walls of the innermost ground-floor rooms suggests the lack of air circulation from these rooms because of rooms on upper levels into which smoky air was not allowed to pass.

Doors and Vents

Many rooms were connected by doorways (Figure 4c) or vents (Figure 4d), and except for Rows Q through R at the east end, there were no wall penetrations of any kind connecting adjacent rows or rooms east and west of a given row. Doorways to the outside were evident in only a few rooms. It
Figure 4. Rooms with interior features: (a) hearths, (b) evidence of smoking or soot, (c) doorways, (d) vents, and (e) sleeping ridges.
is possible that wall collapse destroyed evidence of such exterior doors; however, Hill (1982:75) noted that his Santa Clara informants said that in years past (before the twentieth century), houses were without doors, and that normal entry was by means of a ladder from the ground to the rooftop and another ladder from the roof into the room. In most cases at Puyé, the outermost rooms of suites had no floor features, and it is possible that they served as a sort of vestibule that would accommodate a ladder entry from the roof, thereby avoiding having a ladder into the main living room with its hearth and sleeping area.

**Floors**

Floor treatments varied: tamped, plastered, replastered, unplastered, or built on trashy fill overlying an earlier occupation level. Hill (1982:76) notes that, “Many (Santa Clara) families used earth from the floors of Puyé ruins. ‘This was a black dirt and made a harder floor.’”

**“Sleeping Ridges”**

Excavators of the South House noted at least 25 occurrences of a distinctive floor feature they called “sleeping ridges” (Figure 4e). Usually located in the outermost two or three rooms of suites, the sleeping ridge was simply a low, linear ridge of adobe that spanned the narrow dimension of the room and set aside a space from 150 to 180 cm to the back wall. Located most distant from doors into a room, these ridges were thought to have functioned somewhat like pillows for individuals sleeping with their heads toward the hearth. However, other, more-comfortable pillow-like materials would have been available to the Puyé people, and an alternative function for the ridges might have simply been to set apart a sleeping area where bedding could be stored out of the way when the rest of the room was in use. In Room G8, the entire sleeping area was a raised platform about 15 cm high.

**Talus and Cavate Rooms**

Evidence of many additional rooms can be seen on two levels of ledges at the top of the talus slopes below and east and west of the Community House. Most were built outward from the cliff face as shown by wall remnants in the talus and horizontal rows of post holes where the structures were anchored to the cliff face. Others were cavate rooms formed by carving away the soft tuff bedrock. These were usually the back rooms of multistoried dwelling units that projected outward from the cliffs. Although these rooms are plainly visible today, many more may be concealed by collapse of enormous slabs of tuff that were weakened by quarrying and the construction of cavate rooms below.

A number of dwellings along the cliffs were excavated—and many more pot-hunted—but little data about them seem to have survived. Whether or not the talus and cavate dwellings were occupied at the same time as the Community House remains to be conclusively demonstrated. It is likely that the earliest levels would be of the Coalition period and that they continued in use throughout most of the Classic period.

On two occasions I have observed the mesa-top and cliff dwellings following winter storms that deposited 15 to 30 cm (6 to 12 in.) of snow. Given a day or two with the sun low in the winter sky, the cavate and talus ruin areas had warmed sufficiently to melt all the snow, whereas that on the mesa top remained. Thus, it may have been more desirable to use the talus ruins and cavates during the winter when they would be more protected from snow accumulation.
and the wind. During the summer, however, the Community House occupants would have been exposed to the cooling breezes of the summer. Somewhat incongruously, living in the Community House may have had its disadvantages during the summer season, also. In the summer of 1980, lightning struck the spectators of the Puye Cliffs Ceremonial, killing three Santa Clara Pueblo women. This vulnerability led to temporary cessation of the popular tourist attraction, and in subsequent years it was relocated.

RESERVOIR

Most visitors to the Puye do not even notice the low, U-shaped embankment of rock and earth about 60 m west of the northwest corner of the Community House. Recognized early by non-Indians as a reservoir, the feature apparently gained no careful attention until William F. Turney documented its salient features and estimated its capacity (Turney 1985:43–57).

The embankment may extend more deeply than its visible rubble implies, since it apparently spanned the upper reaches of a substantial drainage that exits the mesa top to the northeast where it drops the bedrock mesa into Santa Clara Canyon. Turney estimated that water drains about 2 ha (5 acres) of gently sloping land west of the Community House, originally filling the reservoir to a maximum depth of 1.5 m (5 ft) at its downstream end and supplying .06 hectare-meter (.48 acre-foot) of water for the Puye inhabitants.

Turney inferred that the reservoir was for drinking water and that, “on the basis of 30 days with no supplemental precipitation, the reservoir would have provided water for some 1,300 persons at the consumption rate of 1.75 GCD [gallons per capita per day]” (Turney 1985:50), or 6.6 liters per person per day.

However, if the South House is used as an example, all the structures of the Community House appear to have been planned to be built rapidly—almost simultaneously. If this was the case, great quantities of mud mortar for its construction would have been constantly required during the building period; a ready source of water would have been essential. Local tradition says that there was a spring in Sawyer Canyon, .4 km (.25 mi) south of Puye Mesa, but its location is not known. Although perennially flowing Santa Clara Creek could have been the source of the water, it lays 1.6 km (1 mi) away and 215 m (700 ft) below in the bottom of the canyon north of Puye Mesa. Even with a large labor supply, the planners of the defensively situated Community House would have realized that spring and summer runoff could be stored if they built a catchment on the mesa top. A reservoir would have been a far more efficient expenditure of labor than hauling thousands of pottery, basketry, and/or skin containers of water from Santa Clara Creek. Once the Community House had been constructed, the reservoir might then have supplied some water for household use—perhaps drinkable but probably not up to modern standards of potability.

BURIAL AREA

William Boone Douglass’ preliminary site map of Puye shows two large, low, apparently nonstructural mounds adjacent to the east side of the Community House (Figure 1). Trenching of the northernmost mound exposed an extensive burial area, yielding all or parts of 169 inhumations. At the lowest level of the mound were a
number of wall remnants of an earlier, possibly Coalition period settlement whose wall orientations did not correspond to those of the Community House rooms. Associated with the wall stubs were masses of charcoal and charred shelled and unshelled corn indicating that the architectural component had been destroyed by fire. After the fire, the structure apparently was dismantled, and usable stone was salvaged for construction of parts of the Community House. The residue—the adobe mortar from the early-component dwelling—remained as a convenient burial area for the later inhabitants of the Community House. The dominant orientation of the burial was to the west and northwest, and cotton cloth wrappings were associated with some. However, few burials had any grave goods.

DATING

The last formal excavations at Puye were completed by 1926—too early to take advantage of A. E. Douglass' developing dendrochronology. Consequently, no tree-ring specimens were recovered or preserved during the excavations. A custodian from Santa Clara Pueblo collected some specimens in 1931. In 1933, others were collected when Jesse L. Nusbaum, Director of the Laboratory of Anthropology, contracted with the U.S. Indian Service to stabilize ruins at Puye and clear the Community House area of excavation debris to make the site more attractive for visitors. This was one of the earliest and most successful federal relief programs and provided work for a number of people from Santa Clara Pueblo. At the same time, W. S. Stallings, Jr., of the Laboratory of Anthropology, had inaugurated a dendrochronology project aimed at dating archaeological sites in New Mexico. It is quite possible that Nusbaum and Stallings encouraged the supervisor of the stabilization project, B. A. Reuter, to salvage whatever wood and charcoal that might have survived in the Puyé backdirt piles.

No information is available concerning how the specimens were collected and preserved, but it was probably rather casual. During the excavations, wood or charcoal would have been discarded like any other fill material from the rooms, so the specific provenances of the materials within the Community House could not be ascertained. Additionally, by 1933, the salvaging of tree-ring specimens may have included ones from the East and West Houses, as well as the South House. Nevertheless, the potential for them to yield dates was great, even if the specimens had been exposed to weathering during 5 to 25 years.

The Laboratory of Anthropology’s dendrochronology project terminated when Stallings left for military service during World War II, and eventually the tree-ring specimens were transferred to the Laboratory of Tree-Ring Research in Tucson. In view of the conditions under which the specimens were recovered and the fact that outside rings proved to be missing on almost all specimens, the latter institution could provide only very tentative assessment of the use of wood at Puye (Robinson et al. 1972). Nevertheless, the estimates coincide with much of the general time range of Puye, as indicated by the pottery assemblage.

The Puye tree-ring series spans an overall time range from 1413 to 1577, but only four dates—1543, 1544, 1574, and 1577—were considered to be possible cutting dates (Table 1). However, the dates obtained are well within the time ranges of most of the pottery types associated with Site LA 47. The absence of expected thirteenth- and fourteenth-century dates

Stewart Peckham
Table 1. Relative Frequencies, by Decades, of Tree-ring Dates from Puyé.

<table>
<thead>
<tr>
<th>Decades</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1411 to 1420</td>
<td>1413vv, 1416vv</td>
</tr>
<tr>
<td>1421 to 1430</td>
<td>0</td>
</tr>
<tr>
<td>1431 to 1440</td>
<td>1432vv, 1437vv</td>
</tr>
<tr>
<td>1441 to 1450</td>
<td>1445vv</td>
</tr>
<tr>
<td>1451 to 1460</td>
<td>1452vv, 1454vv</td>
</tr>
<tr>
<td>1461 to 1470</td>
<td>1466++vv</td>
</tr>
<tr>
<td>1471 to 1480</td>
<td>1474+vv</td>
</tr>
<tr>
<td>1481 to 1490</td>
<td>1488vv</td>
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<tr>
<td>1491 to 1500</td>
<td>1498vv, 1498vv</td>
</tr>
<tr>
<td>1501 to 1510</td>
<td>0</td>
</tr>
<tr>
<td>1511 to 1520</td>
<td>1516+vv</td>
</tr>
<tr>
<td>1521 to 1530</td>
<td>1521vv, 1521vv, 1525vv, 1526vv, 1526vv, 1526vv, 1526vv, 1526vv, 1526vv, 1526w, 1526v, 1528vv, 1526vv, 1526vv, 1526vv</td>
</tr>
<tr>
<td>1531 to 1540</td>
<td>1531v, 1534vv, 1536+r, 1537vv, 1539+vv</td>
</tr>
<tr>
<td>1541 to 1550</td>
<td>1543r, 1543v, 1544r, 1546vv, 1547vv, 1547vv, 1548vv</td>
</tr>
<tr>
<td>1551 to 1560</td>
<td>1554++vv</td>
</tr>
<tr>
<td>1561 to 1570</td>
<td>1562+v</td>
</tr>
<tr>
<td>1571 to 1580</td>
<td>1572vv, 1572vv, 1574r, 1575+v, 1577r</td>
</tr>
</tbody>
</table>

Key: r=less than a full section is present, but the outermost ring is available around the circumference; v=a subjective judgment that the date is within a very few years of being a cutting date; vv=no way to estimate how far the last ring is from the outside; +=one or more rings may be missing from the series; ++=a ring count is necessary because, beyond a certain point, the specimen could not be dated.

suggests that no Coalition period occupation is probably represented. A slight clustering of 21 dates in the 1521 to 1550 time range, including eight to ten dates in the decade from 1521 to 1530, corresponds with the period when Olinger and I (Peckham and Olinger 1985) postulated that Puyé was reoccupied and possibly saw new construction by Tano (Southern Tewa) migrants who made the late and technologically intrusive glaze-decorated pottery that occurs in abundance at Puyé.

B. POTTERY

Although many thousands of potsherds were probably uncovered during the Puyé excavations, few were saved. The value of pottery classification had not yet been recognized. Thus, what remains in the collections of the Museum of New Mexico includes 88 whole or restored vessels and a small number of potsherds (Table 2).

DISCUSSION

Coalition period pottery (Santa Fe Black-on-white and Wiyo Black-on-white) is present in the small collection of sherds from the Community House. Their presence suggests that the burned (and razed) houseblock fragment found at the bottom of the Burial Mound area may have been a Coalition period structure. The separate, smallish sites west of the Community House also indicate that the
Table 2. Summary of Pottery Types Present at Puye in the Collections of the Museum of New Mexico.

<table>
<thead>
<tr>
<th>Pottery Type</th>
<th>Vessels</th>
<th>Potsherds</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEWA SERIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kapo Black</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Potsuwi’i Incised</td>
<td>3</td>
<td>X</td>
</tr>
<tr>
<td>Tewa Polychrome</td>
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<tr>
<td>Sankawi Black-on-cream</td>
<td>3</td>
<td>X</td>
</tr>
<tr>
<td>Cuyamungue Black-on-tan (Biscuit C)</td>
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<td></td>
</tr>
<tr>
<td>Bandelier Black-on-gray (Biscuit B)</td>
<td>9</td>
<td>X</td>
</tr>
<tr>
<td>Abiquiu Black-on-gray (Biscuit A)</td>
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<td>X</td>
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<tr>
<td>Wiyo Black-on-white</td>
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</tr>
<tr>
<td>Santa Fe Black-on-white</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>“Chaco 2” Black-on-white</td>
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<td>X</td>
</tr>
<tr>
<td>RIO GRANDE GLAZE-DECORATED</td>
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<td></td>
</tr>
<tr>
<td>Cicuye Glaze-on-red (Glaze F)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Kotyiti Glaze-on-red (Glaze F)</td>
<td>4</td>
<td>X</td>
</tr>
<tr>
<td>Kotyiti Glaze-Polychrome (Glaze F)</td>
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<td>X</td>
</tr>
<tr>
<td>Tiguex Glaze-Polychrome (Glaze F)</td>
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<td>X</td>
</tr>
<tr>
<td>(Glaze E-F miniatures)</td>
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</tr>
<tr>
<td>Escondido Glaze Polychrome (Glaze E)</td>
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<td></td>
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<tr>
<td>Pecos Glaze Polychrome (Glaze E)</td>
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</tr>
<tr>
<td>Puaray Glaze-Polychrome (Glaze E)</td>
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<tr>
<td>San Lazaro Glaze-Polychrome (Glaze D)</td>
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<td>X</td>
</tr>
<tr>
<td>(Glaze D miniatures &amp; eccentrics)</td>
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<tr>
<td>Espinoso Glaze-Polychrome (Glaze C)</td>
<td>5</td>
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<tr>
<td>Glaze C unidentified</td>
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<td>OTHER TYPES</td>
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<td>Jemez Black-on-white</td>
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<tr>
<td>Jemez Culinary</td>
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<tr>
<td>RIO GRANDE PLAIN UTILITY</td>
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<td>Standard size</td>
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<tr>
<td>Miniatures</td>
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</tr>
<tr>
<td>Sapawe Corrugated</td>
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<tr>
<td>Tesuque Indented</td>
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<tr>
<td>P III Indented Corrugated</td>
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<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>92</td>
<td></td>
</tr>
</tbody>
</table>
isolated mesa top was choice for a few Coalition-period households.

There may have been some interval between the burning of the small-house component (early Coalition period?) adjacent to the Community House. Elsewhere, Coalition pueblos with plazas evolved—as at Leaf Water Pueblo (Leubben 1953) and Arroyo Hondo Pueblo (Creamer 1993)—and the beginning of construction of the “full-grown” Classic period Community House. Regardless of how long this interval of abandonment was, it is reasonable to infer that the Puye Community House had its beginnings during the late fourteenth or early fifteenth century, when Abiquiu Black-on-gray was being produced.

One of the most conspicuous features of the great Community House at Puye is the regularity of its overall plan, particularly as seen in the original ground plan of the South House. Judging from the uniformity of its 14 parallel rows of rooms, the latter structure seems very likely to have been constructed according to an orderly, preconceived design that closed the south side of the plaza. The rooms may give the appearance of having been built simply by constructing a series of parallel walls and then filling in between them with cross walls to form the rooms. However, a study of the wall abutments shows that the suites of rooms on the north side of the houseblock were probably built at least slightly before the suites on the south side. Thus, it would appear that there was some initial and continuing decision-making and even work supervision—either by agreement among the participants or a mandate from a community leader—that would ensure that the location, plan, and construction of the South House would not conflict with a preconceived plan that had been established for the completed Community House.

Building the Community House was a substantial undertaking that would have required more than just agreement on the general plan of the pueblo. The number of rooms in each row also seems to have been predetermined, inasmuch as there were quite consistently more rooms per suite on the more desirable side—toward the plaza as a focus of daily and ritual activities—than in the south-side suites. The plaza-side walls of the outermost rooms on the north side present an irregular configuration that gives the impression that there may have been decisions to allow occupants to enlarge the dimensions of some of these rooms to meet their specific needs (possibly family size or prestige).

The adoption of the plaza may represent a significant shift in community thinking in an area where the pattern of dispersed independence was common for many earlier Coalition-period small house sites. The plaza may have been the means for focusing the attentions of the village inhabitants toward their collective benefit and the group as an organization. The size of the Community House also may indicate a substantial population increase in the area and even a response to the almost uncontrolled lineal growth of the talus and cavate units. The predetermined community plan on the mesa-top location certainly would have accommodated the demand for Lebensraum by an influx of new people, as well as putting a limit on the numbers that could be admitted. If all the suites of the North, West, South, and East houses were juxtaposed into an east-west line of suites,
the alignment would extend over 460 m long with almost 1,300 ground-floor rooms. Intensive and wide-ranging site surveys of the Pajarito Plateau might shed more light on the evolution of the settlement patterns and the dramatic transformation of the allocation of both dwelling and agricultural space and the recognition of community territories.

Santa Clara Pueblo traditions state that Puye was occupied on separate occasions by two groups of people and each time was abandoned because of drought. This is at least partially borne out archaeologically in the South House observations of multiple floor levels and rooms built on trash. Ceramics seem to show a continuity of occupation, though there may have been a short hiatus. Tree-ring indices (Dean and Robinson 1977) for the Jemez Mountains suggest that, between 1418–1424, there were 5 years of markedly low tree growth—conceivably a drought of disastrous proportions. This may have prompted the original Puye people to move down to the Rio Grande valley where irrigation farming had begun to be practiced. More or less concurrently, Southern Tewa (or Tano) people appear to have abandoned their plaza-type villages in the middle Rio Grande area at and near present-day Cochiti Pueblo and migrated northward to the recently vacated Community House at Puye. Their presence at the latter site is indicated by the sudden appearance of glaze-decorated pottery (Shepard 1942), later identified as San Lazaro Glaze-Polychrome and Puaray Glaze-Polychrome (both previously Tano products). The Tano tradition of glaze decoration persisted, but their pottery vessels at Puye were tempered with distinctive volcanic tuff instead of the welded tuff common in the Cochiti area (Olinger 1991; Warren 1977, 1979). Aside from this unusual occurrence, there would have been no way of identifying the Tano migration to Puye.

Ultimately the Tano, too, abandoned Puye, probably shortly after the latest tree-ring date in the Puye series—about A.D. 1577. Following this date were at least seven much drier than normal years, 1579 to 1585, in the Jemez Mountain region (Dean and Robinson 1977). It presumably reflects the absence of tree cutting at Puye and movement of the Tano down to the Rio Grande valley—and their being welcomed by the people of K’apo (the Tewa name for Santa Clara Pueblo).

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A major part of the work leading to this paper was done by others almost 90 years ago, most notably the excavators mentioned here. Encouragement for me to prepare this paper came from longtime friend and civil engineer, William F. Turney, of Santa Fe, who was intrigued with the prehistoric reservoir at Puye, as well as being interested in the engineering skills of prehistoric people around the world.

The Puye Cliff Dwellings are owned and administrated by the Pueblo of Santa Clara. Many friends at Santa Clara shared my interest in Puye and freely gave assistance and encouragement. Among them were Joe Baca, Juan Chavarria, Walter Dasheno, Tessie Naranjo, Tito Naranjo, Robert Suazo, Rina Swentzell, Calvin Tafoya, Edwin Tafoya, and Paul Tafoya.
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—Santa Fe

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In this paper we address two points: (1) the validity of oral literature, that is migration narratives and poetry, as data for elucidating culture histories, and (2) the differences in world views and values between ourselves and others that contribute to misunderstandings when we use oral literature to "augment" the archaeological record.

**ORAL LITERATURE**

In 1976, C. Schaafsma (1976:196–197) suggested that Hosteen Klah's 1938 account of the Yeibechei story as summarized by Mary Cabot Wheelwright might be evidence that the Navajo were living in the Piedra Lumbre Valley above Abiquiú at the time of the events described. This would have been approximately between 1580 and 1710. According to Klah, the "Dreamer" was hunting a deer near Canjilon Mountain, which rises to the east of the Piedra Lumbre Valley, and he lost track of the deer at the Chama River (Klah 1938:1). Later he encountered four mountain-sheep beings (Klah 1938:3). After various events, they turned him into a sheep like themselves, and all embarked on a supernatural journey that took them on a circuit around the Four Corners region. Places included Horse Lake in the Jicarilla Apache country, Huérfano Mountain, Aztec, Mancos, and west from Ute Mountain. Crossing the San Juan River near the Four Corners, they finally arrived at White House in Canyon de Chelly (Klah 1938:7), where a major ceremony took place. After the ceremony, "the travelers visited some of the Sun People who were dancing inside a big rock....They came to another big rock and found some girls grinding corn in a cave" (Klah 1938:9). Afterwards the travelers went on over the Chuska Mountains and to Crownpoint (Kluh 1938:9)...and after various other events, back to the Chama (Kluh 1938:10).

All of this makes good geographic sense and constitutes a reasonable trip around the Four Corners country from the Chama River valley and back again. Faris (1990) has recently published the full text of Klah's account. It seemed in 1976 that this account substantiated the archaeological evidence that the Navajo were living in the villages then being excavated (C. Schaafsma 1976), which were later called the Piedra Lumbre phase (C. Schaafsma 1979). It seemed reasonable to suggest that the Nightway (Faris 1990) developed when the Navajo were living in the Chama Valley during the seventeenth century. Since the Dinetah region (including the Largo, Gobernador, and upper San Juan River valleys) has abundant archeological evidence for the
Nightway between 1700 and 1750 (P. Schaafsma 1980, 1992), it seemed reasonable to suggest that perhaps the Navajo took the ceremony with them when they moved there after about 1700 (C. Schaafsma 1976:197).

In subsequent discussions about early Navajo (C. Schaafsma 1978, 1979, 1981, 1992, 1993), no further mention is made of this traditional evidence, however, because other accounts of the Nightway have different geographic settings that are presented with as much internal consistency as Klah’s account. Matthews (1902), for example, published two accounts of the Nightway. One placed the initial events at Tse’gibí, which seems to be a canyon without a definite geographic reference (Matthews 1902:159), and the other placed the same events at a place called “Red Clay Valley, near the San Juan Mountains” (Matthews 1902:197). Matthews addressed this variation by saying that “No two men will tell the same tale exactly alike, and each story-teller will probably maintain that his own version is the only reliable one” (Matthews 1897:50). Faris (1990) found that variability between singers was a major cause of the abandonment of Sapir, Hoijer, and Haile’s joint project in the 1930s and 1940s to document the Nightway. To quote Faris (1990:10), “the grand compilation Haile had hoped for foundered on the enormous variations, for Hosteen Klah’s songs were hardly comparable at all with those of Slim Curly.”

Later Paul Zolbrod (1984) grappled with this type of variability in the oral literature when he attempted to write down the definitive Navajo Creation story. He began by reading Washington Matthew’s account published in 1897 and realized that it was a composite that Matthews pieced together from several sources. Zolbrod himself sought out and found over three dozen Creation Story manuscripts compiled by Gladys Reichard and Father Berard Haile. Zolbrod’s finding is worthy of considerable attention:

Those manuscripts fully demonstrated that the Navajo Creation story was not, strictly speaking, a single story anymore than the Bible is. It turns out to be a kind of boundless, sprawling narrative with a life of its own, so to speak, fixed in its actual limits only by what might be recited during a particular performance. From telling to telling it could change depending upon the singer, the audience, the particular storytelling event, and a very complicated set of ceremonial conditions having to do with illness, departure, return, celebration, or any one of a number of other social occasions. Incidents lifted from one telling might be included in another. Discovering “fragment” after “fragment,” I concluded that any written text would have to be arbitrary in its length and in the extent to which dialogue might be included or details added or deleted. If what Matthews wrote out was “incomplete,” that was because any particular telling of any particular portion of the story was but a finite manifestation of any entire tradition infinite in the possible ways it could be disclosed...Suddenly I found myself struggling with the enormity of what I was trying to do. Who was I to decide what to include and what to leave out? I am not even sure I could ever get very many Navajos to agree on a "standard" text. [Zolbrod 1984:19]
What Zolbrod discovered, in addition to variability among versions, was the difference between a dynamic oral poetry tradition and the frozen, crystallized poetry of literate traditions. "In many respects, then, a text is a mute, lifeless artifact" (Zolbrod 1984:24). People used to literate poetry expect there to be a single "true" account of something, whereas oral traditions are a dynamic flux emerging from a central core of basic values. It is the central core of basic values that counts and not the details of setting, geography, and so forth. The core values are remarkably steady and give guidance to people's lives, whereas the individual renderings are subject to a high degree of variation in exterior details.

**WORLD VIEW**

The second point we want to address focuses on differences in world views between archaeologists and the people they study. Since the mid-1980s, differences in cognitive universes and cultural values have become matters of considerable interest (Preucel 1991). The topic was recently confronted in regard to rock-art research (P. Schaafsma 1994, 1996). This presentation focused not only on differences in perceptions of space, time, and history between Western thinking and that of others, but dealt at length with a historical exploration of the foundations of Western thought, to bring into relief how we ourselves are trapped in our own paradigms.

If we go to the Bible, where the stories with many of the underpinnings of Western Cultures are written down, we find that our world view is unified by "a few deep structural principles having to do with a common template of understandings" (Gossen 1986:ix). Pertinent to the current discussion are the linear concept of time and establishment of secular versus sacred space. These define a structural armature, a term used by Eva Hunt (1977), that refers to the structural or supporting framework that determines our view of the world. Hunt stresses that such armatures are "quite fixed over long periods of time, across geographic, social, and culture boundaries" (Hunt 1977:259). Hunt was referring to basic structural elements in Mesoamerican thought, but the concept equally applies to structural armatures underlying notions of time and space within the Judeo-Christian symbol system and standard Western science. [P. Schaafsma 1994]

It is an inescapable conclusion that science itself is not exempt from scrutiny (C. Schaafsma 1991). One of the emerging insights is that articulated by Robert Preucel (1991:27): "Our Western theories and language actually impede our communications with those of radically different world views." It is imperative to recognize, for example, that linear time or history is a distinctive Western invention. Heisenberg and Bohr, the primary architects of quantum theory, both apparently regarded time and space as "mental" constructs and not part of the world independent of man (Heisenberg 1958:90–91).

**COMPARISONS**

Differences in world views are extremely relevant in the contemporary arena of archaeological studies in the Southwest and elsewhere, where an attempt is made to integrate native narrative accounts with archaeological data. All of this is done in the current forum of presumed cooperation with
native peoples. This attempt fails, however, to recognize the profound cultural differences that underlie the archaeologist’s search for some kind of absolute historical “truth” versus native purposes in traditional narratives. The result is not only naive, but it compromises both sides.

The differences in paradigms between archaeologists and native peoples have been recently stated so eloquently by Tessie Naranjo (1995). She addresses this problem in regard to Santa Clara migration stories, noting that, “the details of exactly where or how their ancestors moved are not important: the essential element is movement” (Naranjo 1995:247). Movement in itself as something to be valued and emphasized is the very essence of the story—something that would never occur to most Western archaeologists. She also notes that there is never any single version of any story, that locations and boundaries vary. “The primary concern is not with specific data but with the larger issues of movement, place-making, breathing, and dying” and, that in this framework, “one person’s truth does not invalidate another’s” (Naranjo 1995:249).

In Southwestern oral traditions, it is well known that mythic events are ascribed to specific landscape features and places. At the same time, however, this linkage is a flexible one that can be moved about as the observers move about the landscape. The Puebloan concept of “center,” for example, is abstract, not tied in an absolute sense to a specific place in the landscape. It is the sipapu—simultaneously a shrine in or near the village, the plaza, the village itself; if the village moves, so do all the centers. Likewise, the final resting place of the Navajo War Gods, the “Place of the Meeting Waters,” for the eastern Navajo is where the Pine and San Juan Rivers come together in northern New Mexico (P. Schaafsma 1963:63–64) and, for the northwestern Navajo, it is Navajo Mountain, near the confluence of the San Juan and Colorado Rivers in southern Utah (Luckert 1977:70–71). Place is flexible and changeable, depending on the perspective of the viewer, but is equally true, no matter where it is. This perspective is reminiscent of Bohr’s (1987:24) observation from physics that there is an essential dependence of every physical phenomenon on the standpoint of the observer.

These examples warn against simplistic interpretations based on Western paradigms of native stories. We are now in a better position to evaluate how perspectives peculiar to the West impact our perceptions of the cultures and ideologies of others, as we aim for scientific objectivity and value-free analysis, as if such were possible. At the very least, interpretation of the ideological components of other cultures demands conceptual flexibility.

The Navajo, in his storytelling and the values that he communicates, and the anthropologist, in analyzing the same story from a Western point of view, are each operating in their own closed, axiomatic, conceptual system, as described in 1929 by Heisenberg (1972:98–99). In 1938, Bohr (1987:30) indicated that each conceptual system is true in the sense of being internally consistent and valid within its own frame of reference.

In 1985, Edward Harrison (1985), a physicist, generalized the trend of thinking derived from Heisenberg and Bohr, using the metaphor of masks of the universe.

Each universe or mask presents a conceptual scheme that organizes

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human thoughts and shapes human understanding. Generally, within each universe, the end to the search for all knowledge at last looms in sight. Each universe in its day flourishes as an awe-inspiring, self-consistent scheme of thought.... Each universe determines what is perceived and what constitutes valid knowledge, and the members of each society believe what is perceived and perceive what is believed. [Harrison 1985:vii, 1-2]

The one unequivocal point that Harrison maintains in his book is that these universes apply to all of us: Scientists are not exempt. Archaeologists are not exempt. Navajo and Pueblo are not exempt, either.

Harrison lays the groundwork for a profound cultural relativism (C. Schaafsma 1991), and he provides a framework for understanding religious poetry from cultural contexts other than our own, such as the Navajo poetry that Zolbrod has examined. Poetry is one place where the profound ordering beliefs of a system for thought emerge. Any given poem is not a complete embodiment of the whole but a particular rendering of the deeper values that remain hidden, obscured, and fluid in their combinations from poem to poem, but ultimately true to the depths. In the Navajo paradigm, the landscapes and places described may correlate with topographic features and locations important to Navajo in any given region at the moment the story is told, but it is not at all important that these topographic features articulate with places on USGS topographic maps from now ad infinitum.

Now the question emerges, can we switch from one system of thought to another? It would seem that we cannot, because hidden assumptions within any given paradigm will force compliance with the whole system of thought, thereby leading to profound inconsistencies. In the example cited above, if we were to embrace Klah’s account because it has a reasonable fit with other data and attempt to fit it into a seventeenth-century framework, we would likely be confronted by someone who would argue that the girls grinding corn in a cave in Canyon de Chelly (Klah 1938:9) were actually pre-1300 Anasazi girls and all events date before 1300. Such accounts are subject to a wide array of interpretations and are best left alone as data for scientific purposes. Different systems of thought may be complementary in Bohr’s (1987:30) sense and pertain to different realms of experience, but they should not be mixed.

Instead of demanding that we live in a universe, maybe Naranjo (1995:249) is right—"We do live in a multi-verse"!

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For some years, I had planned a trip to the Jornada del Muerto. The 'Jornada,' as more commonly referred to, covered a large portion of a ranch belonging to Charles Travis Turney, my father. The ranch was originally the Bar Cross and was later the Tee Hook, a brand brought by my father to New Mexico in 1900. The Jornada or Tee Hook Ranch existed from 1900 to 1924, covered 1,000 sections, and at one time ran some 27,000 head of cattle. As a very young boy, I was my father's constant companion. After commencing grade school, I lived on the ranch during the summer months, and at age 10, I contributed my part of "tailing up" cattle movements. Many places, both historic and prehistoric, were vividly impressed upon me. It was my intention to revisit the area and attempt to locate areas of interest. Dr. Fred Wendorf suggested the need for a survey, and Mr. Stewart L. Peckham supplied valuable literature and discussions for the journey.

In general, tourists are not welcome on a cow ranch, and most outsiders receive a polite coolness. Knowing ranch protocol and trusting the Turney name still made me welcome, I was not hesitant to enter the area again.

On March 16, 1974, in company of my youngest son, Billy, and my son-in-law, George Garris, we left Santa Fe going down the Estancia Valley and stopping at Abo Monument for lunch. Our transportation consisted of a four-wheel drive Toyota Land Cruiser, winch equipped. We carried extra gas, water, grub for a week, bed rolls, and chuck box. Also, as we were entering one of the few remaining remote areas in the Southwest, we carried shovels, tow ropes, CB-5 watt radios, axes, detailed State Highway maps, USGS quadrangle maps, field survey equipment, field glasses, first-aid kit, and other survival equipment. The Jornada is certainly no place for an ill-equipped expedition and should not be entered except when accompanied by a person familiar with the terrain. Shown in Figure 1 is the Jornada in relation to the general area, the route taken, and the Turney Ranch.

HISTORIC DEVELOPMENT

In modern-day parlance, the Jornada covered the route from Chihuahua to near Socorro, New Mexico. To those familiar with the area in the 1900s, the Jornada del Muerto commenced at Fort Selden and extended to south of Socorro near the now-abandoned town of San Marcial, some 85
Figure 1. General location of the Jornada del Muerto and the former Turney Ranch.
odd miles (about 136 km). No water or live stream existed on the route. At the time of Spanish travel along the Camino Real and later, assuming 10 mi (16 km) a day for an ox-team and 20 mi (32 km) a day for a horse-drawn team, then the Jornada was a formidable barrier to be reckoned with. In later years, circa 1860, a stage route was established north, water being developed at Point of Rocks and Aléman Ranch. I am not familiar with the development of water past present-day Engle.

A line of mesquite identifies the Chihuahua-Santa Fe Trail north of Fort Selden. Oxen were fed on mesquite beans, and not all of the beans were digested, hence the trail can be identified on aerial photographs by a row of bushes.

**PREHISTORIC RUINS**

The Jornada is a closed basin with numerous wet-weather lakes. The basin, according to Darton (1928), is an anticline with an alluvium or bolson deposit. A few limited arroyo cuts exist near the mountain ranges. The closed basin, resulting in numerous wet-weather lakes, is clearly indicated on maps and aerial photographs, including the FAA Sectional Albuquerque Air map. It is highly probable that, during the Wisconsin glaciation, the Jornada was wet and cold, and the present-day dry lakes were extensive permanent lakes supporting a large animal population. To my knowledge, there are no reports of prehistoric bones. This could be due to lack of deep-cut channels.

Several Archaic sites exist in the area southeast of Aléman Ranch. Mrs. Ben Cain, whose ranch is near the Prisor Hills, assisted in pointing out ruin sites. Mrs. Cain has an interest in ancient sites and could be of assistance in future work in the area.

Five sites were recorded along the route through the Jornada. Site forms were completed for these sites, and their locations were indicated on USGS maps. Samples of chippings, sherds, and worked stone were taken at each site and have been deposited with Mr. S. Peckham of the Museum of Anthropology in Santa Fe. Photographs were included for each site. A sample of undisturbed charcoal was collected at South Prisor Hills Site. No sketches were made, as there were no visible remains, such as walls or pits.

**Prisor Lake Site**

Apparently Prisor Lake Site is campsites on the edge of the lake. I remember water in the lakes in 1922 or so, but none in the last 20 years, according to the local rancher, Lewis Cain. No pottery was found. Numerous small piles of rock were noted with apparent fires. We obtained a sample of the chippings.

**South Prisor Hills Site**

Mrs. Cain has some artifacts, including a bowl she says she obtained here. No sign of walls or dwellings were noted. Rock mounds, 3–6 ft (1–2 m) in diameter, with fire in the center, were observed; the rock appears to be imported. The site is located on the west side of dunes. We found a few sherds with red or brown on one side. A sample of undisturbed charcoal was collected at South Prisor Hills Site.

**North of Flat Lake Site**

The site is in low, sandy dunes, with the floodplain of the lake to the east and west.
Piles of charcoal and burned earth were noted. The site is similar to the first two sites. We found a few sherds (obtained a sample) and lots of chippings. The sand hills to the west of Flat Lake Well were not investigated but probably contain sites.

**Cottonwood Spring Site (LA 174)**

The Cottonwood Spring Site is very extensive and has been well known for many years. Extensive potholing and digging has occurred since 1920. The area is now within the White Sands Proving Ground and can only be entered with permission from White Sands or the Jornada Experimental Station.

Cottonwood Spring and Goldenberg Spring still flow and probably provided both domestic and agricultural water for prehistoric people.

The Cottonwood Site is littered with sherds and has produced numerous beautifully made basaltic manos, metates, and pestles. In about 1930, I found six basalt metates in what appeared to be a room. A light rain was falling the day we visited the site, and I could find no outline of buildings. The numerous parts of the site, of course, are in the usual sand dunes.

Mr. Fred Ayres, formerly with the Jornada Station, has a collection of points, shaped pottery, sea shell beads, drilled pottery, and similar artifacts found in this area. To the best of my knowledge, no work by trained archaeologists has been done.

Steve Lekson\(^3\) (Lekson and Rorex 1987) in documenting Cottonwood Spring, found some problems with Yeo and his sections. (I knew Herb Yeo and he was a good engineer and surveyor. Yet, when checking some of his sites in the Nogal Mesa area, I found his Section descriptions were sometimes in error, even a township was off once.)

As I remember, there is a historic grave, marked only by a pile of rock, in the vicinity of Lekson's Area D, LA 174.

The road through the Cottonwood Spring Site was a wagon trail road made by my father, possibly in 1905, to reach his stock tanks north of Cottonwood. The pipes at Cottonwood were installed also by my father, and he had a windmill there. I am sure he took the easiest route across the terrain (Lekson and Rorex 1987:38). Ranchers in general are not interested in prehistoric sites, and in most cases probably did not recognize them. The road was bladed sometime after World War II.

**College Ranch Site**

The site mentioned by locals near the College Ranch could not be actually located, although the usual sand dunes, occasional stone chips, worked broken stone pieces, and a wet-weather lake areas were present.

**Summary**

The sites located on the Prisor Draw (some maps refer to this as Aléman Draw) were located in sand dunes, and in some instances appeared to be on a shore line. No sherds were found, only stone chippings or flakes. Local ranchers report finding points occasionally.

Sites in the Red Lake and Flat Lake areas did contain an occasional sherd. Potholing has been limited, and further study would probably produce undisturbed sites, particularly in "blow out" areas.
There are numerous sites on the Jornada. The burnt rock middens are quite puzzling, particularly when there are no sherds.

**HISTORIC SITES**

The Chihuahua Trail, as previously mentioned, traversed the western side of the basin. Two stage stops were located north of Fort Selden. I can recall a few walls at Point of Rocks, but we were unable to find them this trip. I did locate a large dam, long ago washed away with flood waters, that was near the old walls. A windmill and well exist near the former stage stand. No report was made for this site on the museum standard form; location was shown on the overall map.

The existing Aléman Ranch buildings still incorporate a portion of the original stage stand. Rooms exist with exposed cottonwood vigas, brush, grass, and mud roofs, all in excellent condition. Dendrochronology might yield some interesting dates. The present owners, Mr. and Mrs. Lewis Cain, would welcome a visit by trained persons. Excavations would probably yield the outline of the compound. I can recall a "six hole" with rifle loopholes, but was unable to locate the building on the visit. No museum report has been made; location was shown on the general map.

The stage trail past Point of Rocks and Aléman Ranch has yielded broken ox-yokes, ox shoes, and other trail equipment in years past. It is possible some cast offs still exist.

**Detroit Ranch**

About 1920, the Las Cruces, Socorro, Albuquerque Highway wandered up the Mesilla Valley north along Alameda Avenue, west of Doña Ana, through Hill, hit the west bank of the East Side irrigation lateral, and followed the bank to the outlet gates on the lateral at Leasburg Dam, over the gates, to almost present-day Radium Springs, under the railroad trestle, and up a sandy draw or arroyo. This arroyo was uphill and a hard pull through the sand to a divide between the Mesilla Valley drainage and Jornada Flats. At about this point it hit the old Jornada del Muerto trail, which was visible by a line of mesquite bushes toward Point of Rocks. Through the years, cowboys would find an occasional ox shoe, and we had a busted ox yoke with the ring on it. This point would be to the south of the present-day rest stops on Interstate 10. After reaching the crest, the old highway veered to the northwest to the bluff above Selden Canyon on the Rio Grande. There is a long slope from the rest stops to the top of Tonuco Flats, a volcano flow. Tonuco has an active fluorspar mine.

By this time, the 1920s cars would have boiled the radiator water away, and Detroit Ranch was a welcome sight. The location is marked today by a quite visible mound of earth, to the northwest of the rest stops. Pat McClernon, living in Las Cruces today, remembers Detroit Ranch.

The mound of earth is my story. Actually it was built of adobes and plastered on the inside with concrete and was a large storage reservoir. My father constructed this reservoir, I would guess, about 1910. To fill the reservoir, he had laid a pipeline down to the river, some 400 ft (120 m) lower in elevation, and installed a boiler and steam pump. I remember riding with him down a sandy twisted road to the west of Detroit Ranch; I must have been about five years old at the time. The boiler was in an adobe building with no roof. I do not remember

William F. Turney 183
the pump, but it probably was a steam piston on one end and a double-acting water pump on the other. I would guess it pumped not over 10 gal (37 liters) per minute, which would be 14,400 gal (54,432 liters) per day. The pipeline as I remember was 1.5 in. (3.8 cm).

The mound cannot be reached by car from the Interstate, you would probably have to start at Rincon. The reservoir can be easily measured, and I would imagine a four-wheeled drive could follow the old road down to the river.

One of my brothers, Jack, told me the family always referred to Detroit Ranch as the "troughs." I believe he was thinking of watering troughs, which were some 2 or 3 mi (3 or 5 km) to the east and fed by pipeline from Detroit.

As I remember the story, the reservoir could not be filled economically, due to leakage of the concrete lining, and my father then drilled a well near the southeast corner of the reservoir, and water ran from the well to the reservoir.

At the well, there was a good two-room adobe house with a galvanized iron roof. The Albuquerque Highway ran between the house and a wooden barn on the east side.

My father's ranch was east of the railroad from Radium Springs, north of the Doña Ana Mountains, to Cutter, east to the crest of the San Andres, and down the mountains to the east-west line north of the Doña Ana Mountains, about 1,000 sections.

Detroit Ranch was a part of the Bar Cross (mentioned by Eugene Rhodes) and belonged to Swift & Company. My father bought out the Bar Cross about 1915 (probably recorded in the Doña Ana County Court House.) The First National Bank of El Paso foreclosed on my father's Jornada Ranch in 1924.

The man living at the Detroit Ranch and working for my father was Travis Pierce. After his family moved from the ranch, I understood they lived in Hatch.

Just past Detroit Ranch on the highway there was a large, well-painted sign, "This is God's Country, don't drive through it like Hell."

CONCLUSIONS AND RECOMMENDATIONS

Numerous Archaic and possibly preceramic sites exist in the Jornada de Muerto Basin. After our trip through the ranch, these are my conclusions and recommendations:

• Travel in the basin is not recommended for amateurs. Modern-day sedans and pickups will encounter difficulties.

• Visitors should not enter ranches without first obtaining permission. Closed gates must be closed after passing through.

• This preliminary survey would indicate that more detailed searches in the basin would be rewarding.

• The now wet-weather lakes must have been extensive semipermanent lakes during and following the Wisconsin glaciation.

• It is quite possible that the Cottonwood Spring area will be investigated as a part of the White Sands Missile Range work.
being done by a group such as Human Systems Research.

• The Chihuahua-Santa Fe Trail is worthy of further studies.

• I did not know the WSPG boundary was not fenced to the north of the Rope's Springs road. The recommendation of fencing is very much in order. Also, I suggest installation of concertina barbed wire over existing and possible access roads. Backhoe trenches are also effective, if they are dug long enough to prevent driving around them. Those potholers are a rugged bunch.6

The writer would welcome questions and possible discussions. Original maps, negatives, and manuscript are on file in my Santa Fe Office. All artifacts have been delivered to the Santa Fe Museum of Anthropology.

—Formerly of Santa Fe

ENDNOTES

1 This article was based on a report written by William Turney in 1974, with additions from other sources, as noted.

2 Site descriptions were extracted in part from Museum of New Mexico Archaeological Survey forms completed by William Turney.


4 From same letter.

5 From a letter to Patrick Beckett dated June 12, 1986.


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Charcoal drawing by Bill Turney
I do not know when Bill Turney became interested in archaeology, but for several years in the 1950s, our families were neighbors in Santa Fe, and from time to time Bill would tell me about finding an archaeological site during the course of his work as a water engineer or on one of his Sunday expeditions. He and Mary often visited us at the Fort Burgwin Research Center, and they followed with keen interest the archaeological work done at Cantonment Burgwin and at nearby Pot Creek Pueblo. I know Bill would be delighted to have this account of the excavations at Cantonment Burgwin dedicated to his memory.

INTRODUCTION

Military History

Cantonment Burgwin was a small, temporary U.S. Army post established on August 16, 1852, to protect the communities of Taos and Ranchos de Taos from attacks by hostile Indians. The post was named in honor of Captain John H. K. Burgwin of the First Dragoons, who died of wounds received in the assault on the Pueblo of Taos, on February 7, 1847. Cantonment Burgwin was located in a small mountain valley about 16 km (10 mi) south of Taos and adjacent to what was then the road from Taos to Santa Fe. The post was abandoned on May 16, 1860, as part of the Army's reorganization and consolidation that began that year in anticipation of a presumed war between the States. Reports from the Cantonment to Headquarters in Santa Fe in 1859 record that the post was in need of major repair long before it was abandoned, and after the soldiers left, the buildings were allowed to deteriorate and the exact location of the post was lost and became controversial.

When it was first occupied, according to the Post Returns, the Cantonment was manned by one officer (a Second Lieutenant), an Assistant Surgeon (doctor), and 54 enlisted men, including 2 sergeants, 4 corporals, 2 buglers, and 1 farrier/blacksmith. There were also 54 horses, only 50 of which were serviceable.

In their role as the protectors of the Taos area, units from Cantonment Burgwin were sent on several occasions against Ute and Apache bands, usually with little consequence, at least for the soldiers. However, one of these expeditions against an Indian group ended in disaster: on March 30, 1853, in a battle with Apache (probably Jicarilla) near the modern town of Embudo, about 32
km (20 mi) southwest of the Cantonment, 22 soldiers were killed and 20 were wounded. Among those killed were two sergeants, and among those wounded were the officer in charge, the Assistant Surgeon (doctor) who accompanied them, and the third sergeant.

Excavation History

The story of the excavation of Cantonment Burgwin begins in the summer of 1956, when Mr. George Lavender, President of the Pot Creek Logging Company, invited me to meet his business partner, Mr. Ralph Rounds, a Kansas lumberman and owner of the Rancho Rio Grande Grant, a 37,650-ha (93,000-acre) holding south of Taos. It was my plan to ask Rounds to support the excavation of Pot Creek Pueblo, an Indian ruin on his property. Lavender also told me that Rounds was interested in locating an old presidio mentioned in the legal papers for the Grant, so I did some preliminary work in the library before the meeting. There I found a copy of a map of Cantonment Burgwin made in 1853 by Colonel R. F. Mansfield (Figure 1, east is to the top of the figure). In his accompanying report, Colonel Mansfield stated that the post was located 16 km (10 mi) south of Taos, and his map shows Cantonment Burgwin was placed at the confluence of two streams, one of which was named the Rio Grande tributary of the Rio Grande del Norte. A comparison with modern maps suggested that Pot Creek and the Little Rio Grande were the only streams that seem to meet the description in Mansfield’s report.

The Mansfield map shows in the center a large main building shaped like a square-sided figure eight consisting of rows of rooms. The rooms in the west half of the figure eight was for the enlisted personnel. The west end of that quadrangle had two rooms identified as the barracks; the north side had a dining hall and a kitchen; and the south side had a bakery, a storeroom, and the sergeant’s quarters. The east quadrangle was the stable for the horses, tackrooms, and a blacksmith shop. West of this main building, on each side of an open parade ground, were a two-room officer’s quarters, a storehouse, an office/dispensary, and, at the far end next to the road to Santa Fe, a guardhouse. To the east of the main building, behind the stables, were four joined apartments for the laundresses. Across the stream, which we identified as Pot Creek, was located a building for the sutler.

During the course of the meeting with Rounds, which took place at his part-time quarters over his office at the Pot Creek Logging Company sawmill, Rounds agreed to help financially with the excavations at Pot Creek Pueblo, but he also urged me to take an interest in his presidio. He had made several efforts to find it, which had been unsuccessful. I showed him Mansfield’s map, and we decided to take a look in the area where Pot Creek and the Little Rio Grande joined, about 1 mi (1.6 km) northwest of his office. A search of that area showed no evidence of a military post. On the drive to the confluence of the two streams, however, we had noticed several low mounds in the sagebrush flat across the road and about 180 m (200 yd) from his office. I assumed these were small pueblo ruins, and we decided to check them out as we somewhat dejectedly returned to his office. These mounds, of course, turned out to be the collapsed chimneys of Cantonment Burgwin. I learned later that in recent memory Pot Creek had followed a channel...
Figure 1. Map of Cantonment Burgwin, drawn by Colonel R. F. Mansfield in 1853 (courtesy U.S. National Archives).
along the north side of the Cantonment, as shown on Mansfield's map.

The identification of the Cantonment delighted Rounds, and he urged me to perform an archaeological excavation of the Cantonment and if possible to rebuild it. It was Rounds' plan to use the reconstructed Cantonment as a center where he could encourage scientists, writers, artists, and other scholars to work and contribute to the cultural development of northern New Mexico. This Center was to be his way of returning some of the wealth that he had received from New Mexico and from the Rancho Rio Grande Grant. The Fort Burgwin Research Center, which now functions as a summer campus for Southern Methodist University, is the result of Rounds' vision. Each summer, the Research Center hosts field schools in archaeology, biology, and geology and classes in creative writing, Southwest history, visual arts, dance, and music. Unfortunately, Rounds died in the summer of 1959 and did not live to see his dream materialize.

The excavation of Cantonment Burgwin began in June 1957, with the excavation of the main quarters and stable area. The work continued the following summer with the excavation of a building identified as the officer's quarters, and in the summer of 1959, with the excavation of a building at the west end of the parade ground that had been built after Mansfield's map was drawn. This more recent building probably served as additional officers' quarters, and we have identified it as the officers' compound. There were no other excavations at the Cantonment until 1965, when part of the hospital was dug by Herbert Dick (the rest of the hospital was excavated by Anne I. Woosley in 1979 [see Woosley 1980]). More recently, in 1993, most of the storehouse on the south side of the parade ground was excavated by students under the supervision of Michael A. Adler. This report will be limited to a description of those buildings that were excavated under my supervision from 1957 to 1959.

HISTORICAL RECORDS

Shortly after the meeting with Rounds, I began an effort to find out more about Cantonment Burgwin. The most important source for this information was the National Archives in Washington. With the help of the staff of the Archives, I was able to find most of the official army records relating to the Cantonment. These include an almost complete set of the monthly reports of the Cantonment, copies of the official correspondence relating to the post, and court-martial records (there seem to have been problems with excessive drinking, fighting, and other minor infractions in the frontier army). All of these reports provide a wealth of data about life at the post and the military policies of this period.

There are also several published journals by individuals who were at Cantonment Burgwin, the most important of which was kept by James A. Bennett, who was a sergeant in Company I of the First Dragoons and helped build the Cantonment (Brooks and Reeves 1948). Bennett was also seriously wounded in the battle at Embudo and wrote the best-known account of that engagement. Other important sources are "Dear Old Kit," The Historical Christopher Carson (Carter 1968), and the diary of Lydia Spencer Lane, I Married a Soldier or Old Days in the Old Army (1964).

The National Archives and the Smithsonian Institution also have drawings of the Cantonment that were done by
W. W. Anderson, who was Assistant Surgeon at the post from 1857 to 1860. Anderson was an unusual individual. An amateur ornithologist, he made records of the birds in the valley around the Cantonment and sent these, together with many specimens, to the Smithsonian (Hume 1942). Anderson was also an amateur archaeologist. Although there are no records of his excavations, he may have done some digging at the nearby Pot Creek Pueblo, because, while he was at Burgwin, he sent several prehistoric pots from sites in this area to the Smithsonian.

For those interested in the archaeology of Cantonment Burgwin, however, Dr. Anderson's most important legacy are two drawings he made of the Cantonment. One of these looks across the parade ground and provides us with a glimpse of how the buildings looked (Figure 2). It depicts buildings with flat roofs and walls of vertical logs set closely together (and, as we later learned, chinked with clay). The other drawing (Figure 3) is a view of the valley from a hill south of the post, looking north toward Taos, with Cantonment Burgwin in the middle distance. It shows that the Cantonment was much larger by 1857 when Anderson was there than it had been when Mansfield drew his map in 1853, but the importance of this drawing is that it shows the precise position, size, and arrangement of the buildings in the Cantonment. Anderson was a careful draftsman, and the drawing shows the ridgelines of several mountain ranges in the distance. By going to the hill where Anderson made his

Figure 2. An 1857 drawing by W. W. Anderson, Assistant Surgeon, of the buildings of Cantonment Burgwin, looking northeast. Note vertical log walls, flat roofs, windows, and other architectural details (courtesy U.S. National Archives).
Figure 3. View across the valley of the Little Rio Grande, looking slightly east of north. Note that Cantonment Burgwin (in the clearing in the middle distance) then had more structures than was indicated on Mansfield's map. Sketch by W. W. Anderson, not dated, but presumably done between 1857 and 1860 (courtesy Smithsonian Institution and U.S. National Archives).

drawing, observing the skyline to the north, and moving up and down and to the left and right, one can locate the exact place where Anderson stood (Figure 4).

ARCHAEOLOGICAL STUDIES

The Main Compound

The first archaeological excavations were done over an eight-week period in June and July 1957, as an archaeological field school sponsored by Texas Technological University. There were 20 students in the group, from several universities in the Southwest.

The excavations were challenging because, except for the fireplaces, none of the features were well preserved and in many instances were recorded only by traces of bark and decayed wood.

We began with a careful search of the surface of the sagebrush flat where we thought the Cantonment should be located. This search disclosed several low mounds of stones in the area of the main building on Anderson's drawing. There were similar mounds along both sides of the open area (the parade ground) to the west, and another group across the west end of the
parade ground. We decided to excavate the main building first, primarily because it was the largest and most complex structure on Mansfield’s map.

The first pits were excavated beside several of the low mounds of rocks that were evident in the area of the main building. All of these rock piles were quickly identified as remnants of stone and clay fireplaces. Floors of packed earth were also found along the side and just above the base of the fireplaces; in front of each fireplace was a hearth of flat stones and burned clay or adobe bricks (Figure 5). In a few instances, the hearths were framed by boards about 2.5 cm (1 in.) thick and 10 cm (4 in.) wide, standing on edge and partially buried in the floor. Using trowels and shovels, the students then followed the packed-earth floors away from the hearths toward what we assumed would be the walls of the structure.

All of the excavated soil was passed through .6-cm (.25-in.) screens, because on the floors there were occasional artifacts, such as uniform buttons of the First Dragoons, buckles of various sizes, pieces of china, and in the north fireplace in the

Fred Wendorf
enlisted barracks, a woman's shoe, all dating from the period when the post was occupied. There were also numerous scraps of decayed wood that we assumed came from the roof and collapsed walls. However, no pattern was noted that might indicate the structure of the roof, although Anderson’s drawing shows that it was made of horizontal logs or vigas.

The walls were the most difficult to find. In most instances, traces of them were identified by rings of bark ranging from 25 to 30 cm (10 to 12 in.) in diameter at the edges of the floors, usually with no other traces of wood. In a few areas, even the bark was missing; the floor just stopped at soft fill. Here the wall posts had either decayed completely or had been removed, perhaps after the post was abandoned. Once located in two or three places, the walls were exposed by digging a trench 46 cm (18 in.) wide (15 cm [6 in.] wider than the indicated diameter of most of the bark rings), and 30 cm (12 in.) deep along the line of the wall, leaving the circles of bark standing in the center of the trench (Figures 6 and 7). Later, pits were dug across these wall remnants. These showed that, when they were built, the wall posts had been

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Figure 5. Double fireplace between kitchen (on left) and the mess hall (on the right). This fireplace was made of unshaped sandstone slabs set in clay. The hearth in the mess hall had a slab floor, while that in the kitchen was burned clay.
placed upright in trenches about 90 cm (3 ft) deep. At the edge of the floors on the interior walls in the two rooms identified as enlisted men’s barracks and in the dining room, there were traces of white micaceous plaster, similar to that still used occasionally on houses in the Taos area and locally known as *tierra blanca*. When completed, these excavations showed a series of rooms arranged in a rectangle around an open courtyard or patio. Furthermore, the rooms could be identified with Mansfield’s map (Figure 8).

Comparatively well preserved door sills made of cedar planks, from 91 to 107 cm [3 to 3.5 ft] long, 15 to 18 cm (6 to 7 in.) wide and 2.5 to 5 cm (1 to 2 in.) thick, were found in every room, except for one cobblestone sill in the forage area. There were two drains from the patio or courtyard to the outside: one across the mess hall near the east end, and the other just inside the door of the south enlisted men’s barracks. Both of these had sides formed by planks set on edge. At the time of use, they may well have been covered, but when excavated, there was no trace of a cover. There were also two cylindrical pits, each
Figure 7. View looking south down the north enlisted men's barracks of Cantonment Burgwin. Note the two stone and clay fireplaces with slab hearths and the entry hall beyond. The student is clearing the entry threshold into the barracks room.

about 120 cm (4 ft) in diameter and 30 cm (1 ft) deep, inside the doorway of both enlisted men's barracks. The function of the pits is not clear; they both were filled with soft dirt, a few artifacts, and stones.

The locations of windows in the walls facing the courtyard were indicated by clusters of broken window glass next to the walls on the ground inside the courtyard. Windows occurred in the enlisted men's barracks, the dining hall, and the sergeants' quarters. No window glass was found along the exterior walls of the compound.

This structure was obviously designed with security in mind. Most of the rooms in this main building could be entered only from the interior patio; the exceptions were the storage room, which could be entered only through the sergeant's room, and the two enlisted men's barracks, which had doors opening into a central hallway. This central hallway had two doorways: one, the front door in the center of the west end of the quadrangle, was the only opening to the outside; the other opened into what we identified as the patio or courtyard. In the center of the east side of the quadrangle there was another doorway that entered...
Figure 8. Plan of the Main Quadrangle and the stables area as excavated in the summer of 1957. Note that the room arrangements are closely similar to those shown on Mansfield’s Map.

another central hallway with forage and tack rooms on either side and a doorway into the stable area.

The forage/tack and stable areas were dug after the excavation of the west quadrangle was completed. In the tack rooms and the western half of the stables, the same techniques as before were used, but the eastern half of the stables was cleared with a road grader. Careful stripping of the surface with the grader soon disclosed the exterior wall posts and, inside the wall, a series of smaller post remnants and post molds that presumably mark the stalls for the horses. There were several large post holes noted in the northeast section of the stables and two others in the southern section. The function of these is unknown, but they may have been hitching posts. Preservation was poor in the forage area, and we had difficulty following the walls in some sections. The map (Figure 8) shows the positions of all of the posts and post molds found, but it is possible that some rooms in that area lacked dividing walls on the east side and were used as covered shelters for storing food for the horses. An irregular pile of burned clay in the south room of the forage area seems to have been
where the blacksmith did much of his work. Several badly worn horseshoes were found on the floor in this area.

There were two doors to the exterior from the stable area: a 3-m (10-ft) wide doorway in the south wall adjacent to the forge area (wide enough for two horses abreast to pass) and a 1-m (3½-ft) wide door in the north wall. The narrow door gave easy access to Pot Creek, which flowed less than 15 m (50 ft) away. It is likely that the stable area resembled the one shown in a photograph taken at Fort Union, probably in the 1860s (Figure 9).

The Commandant’s House

The officer’s quarters or commandant’s house was excavated in the summer of 1958 and was rebuilt the next summer as quarters for the Director of the Fort Burgwin Research Center. It consisted of a square structure divided into either three or four rooms.

The exterior walls were poorly preserved, but sufficient traces remained to determine the outline of the house and most of the features on the interior (Figure 10). The chimney stones apparently had been removed some time ago, and only clay pads remained; however, the adobe bricks of the hearths were still in place and showed that each chimney served two back-to-back fireplaces. The floors in the officer’s quarters were different from those in the main quadrangle. Here, closely spaced planks (or split logs, we could not establish which) were laid directly on the ground in

Figure 9. Photograph of a stables area at Fort Union, showing upright log walls and flat roofs similar to those at Cantonment Burgwin. Photograph is undated, but probably was taken in the early 1860s (courtesy U.S. National Archives).
Figure 10. Floor plan of the excavated Commandant's House at Cantonment Burgwin. This structure was probably first occupied by Lt. Robert Ransom, Jr., the first Commanding Officer of Cantonment Burgwin. Note the south entryway and vestibule, the two double fireplaces with adobe brick hearths, and the cobble walks on both the north and south sides.
a north-south alignment. The two rooms on the east side were about the same size and were separated by their fireplaces and a vertical log wall. Both rooms had thresholds in the center of the west walls passing into the adjoining larger room(s). The west half of the house may also have been divided into two rooms. In this section there is another double fireplace separating the two areas. There is, however, no evidence of a wall, only two posts that might have been part of a partition. It is possible that blankets or skins might have been hung from the ceiling to separate the area into two rooms.

There was a clear entryway in the center of the south side of the house. This entry seems to have been double, because about 1.5 m (5 ft) inside the entry threshold was another threshold (this part of the passageway may have served as a vestibule), and then two other thresholds into the rooms on each side. Two thresholds at the end of the entryway may indicate a passage and doorways into the room to the north, but this is not clear. There probably was a second entry on the north side of the house; Mansfield’s map shows a small stable on that side of the building (see Figure 1), but that wall was almost completely destroyed. There was a threshold and traces of a wall trench in the proper place for another entry with a vestibule, but the entry could not be defined. Cobblestone walkways were present on both the north and south sides of the house, and a single board or split log at the entry on the south side suggests that here may have been a wood-floored walkway.

The Officers’ Compound

Our first survey of the cantonment showed, at the west end of the parade ground, a cluster of four low mounds that we believed to be collapsed chimneys. Excavation in this area in the summer of 1959, using the same techniques employed on the other buildings, disclosed a structure with six rooms arranged around a courtyard. Three of the rooms were relatively large and three were much smaller (Figure 11). Rooms 1 and 2, both small, were separated by a double fireplace of adobe bricks and a partition wall. Entry thresholds for both rooms were in the east walls. In addition, Room 1 had a threshold and entry into Room 3, the other small adjoining room, which also had another entry threshold in the east wall. It is possible that Rooms 1 and 3 served as one apartment for an officer and his family.

The larger rooms, Rooms 4, 5, and 6, were all nearly three times the size of the small rooms. Room 4 had a large adobe fireplace in the center of the long north wall. There were two entry thresholds into this room, one in the wall at the east end and the other in the south wall onto the courtyard.

Room 5, at the south side of the courtyard, was similar to Room 4, containing two entry thresholds, one in the east wall and the other in the north wall into the courtyard. A large fireplace made of adobe bricks was in the center of the south wall. A small pit filled with irregular stones was found against the wall, separating this room from Room 3. These stones may have been placed to reinforce a weak wall.

Room 6 was slightly smaller than Rooms 4 and 5 and had only one threshold in the south wall, which also entered the courtyard. There was a large stone-and-clay fireplace at the north end of the room.
Figure 11. Floor plan of the Officers' Compound at Cantonment Burgwin, showing the six-room arrangement of the building. All of the rooms except Room 3 have fireplaces. Room 3 may have been used for storage. Some of the hearths are of sandstone blocks and clay; others are of adobe bricks.
RECONSTRUCTION OF THE CANTONMENT

The excavations at Cantonment Burgwin were undertaken with two major goals: (1) to recover as much data as possible about the buildings at the post and the lives of the people who lived there, and (2) to provide the information needed to reconstruct several of the Cantonment buildings so that they could serve as the central headquarters and focus for the research center that was contemplated by Rounds. At the outset, it was understood that it would not be possible to rebuild the structures as faithful copies of the original buildings. They were temporary structures (the word cantonment was then the U.S. Army term for what they now call a camp), and there was abundant documentary evidence that the buildings were about to collapse when the post was abandoned. It was decided to rebuild the structures on the same foundations, with the same entryways and windows, but to use more permanent materials, in this case adobe bricks faced with split logs to resemble their original appearance. Heating, plumbing, and electricity were also installed in the interiors, but the inside walls were coarsely plastered to look like the original, and the concrete floors were finished slightly unevenly, not unlike the original dirt floors. This concept of rebuilding the buildings of the post has been followed in subsequent years as other buildings of the Cantonment have been rebuilt (Figure 12).

Figure 12. View looking northeast across the parade ground toward some of the reconstructed buildings which now house the Fort Burgwin Research Center. In the middle distance are the Main Quadrangle and Commandant's House.
It was a similar philosophy that led us to rename the new facility, the Fort Burgwin Research Center. The term fort was used to imply a permanence to the Center that would be missing had we used the original name. It may make it yet; 1997 will be the fortieth anniversary of the founding of the Fort Burgwin Research Center.

The reconstructions of the Main Quadrangle, Commandant's House, and the Officers' Compound were funded by the Rounds Foundation; however, the Fort Burgwin Research Center now has many new buildings, including an archaeological laboratory housed in the reconstructed post hospital and surgeon's quarters, several dormitories, a dining hall, an arts building, and a dance studio. Most of these facilities were constructed with funds provided by Texas Governor William P. Clements, a long-time friend of Southwestern archaeology and for many years a member of the Board of Trustees of Southern Methodist University.

—Southern Methodist University, Dallas

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Charcoal drawing by Bill Turney.
In the Anasazi Pueblo region of the northern American Southwest, identification of ceremonial chambers, usually referred to by the Hopi word kivas, was perhaps the earliest and still is an often discussed aspect of prehistoric and historic Native American architecture (Brew 1946; Kidder 1958; Lekson 1988; Mindeleff 1891; Smith 1952, 1972). This is a natural outgrowth of the fact that, in the Four Corners region of New Mexico, Colorado, Arizona, and Utah and in the Rio Grande region of north-central New Mexico, specialized structures are found in habitation sites of the Pueblo culture. Although debate still exists about the timing (Lekson 1988), consensus holds that the kiva developed from an early form of domestic dwelling, the pithouse. Based on analogy with historic Pueblos, kivas were in the domain of men and served for conducting ceremonies and ritual and for classrooms and sleeping quarters for older boys and unmarried young men being initiated into ceremonial and ritual roles.

The forms and interior appointments of Anasazi Pueblo kivas vary through time and space. They can be round, rectangular, or D-shaped. Most are small, but some, called great kivas, are quite large, suggesting at least two basic levels of function—clan (or other appropriate small unit) and community. Kivas are incorporated within blocks of pueblo rooms or set apart nearby. Some kivas are even found at some distance from habitation sites. At Mesa Verde in southwestern Colorado and at Chaco Canyon in northwestern New Mexico, kivas attained a relatively strong degree of standardization in shape and internal organization of floor and wall features, making them readily identifiable in the archaeological record. Some scholars maintain that Mesa Verde and Chaco kivas are the only true forms of kivas and that the term should be restricted to them (Albert H. Schroeder, personal communication 1990).

The debate over the identification of kivas in other regions—such as the Kayenta Anasazi and the Sinagua of northeastern Arizona and the Rio Grande Anasazi in New Mexico—arose because structures readily identifiable as ceremonial rooms, however defined, are often missing until late in the prehistoric sequences (Peckham 1979; Smith 1952). And what about other cultures, such as the Mogollon? In his classic essay on the problem, Watson Smith (1952) concluded that kivas are defined by the archaeologist on the basis of one or more attributes that set them apart from the majority of structures at their respective sites. While any number of attributes may be
appropriate in this regard, the most common one is a larger size. This would be especially true in those instances where the ceremonial society using the structure is larger than the household group.

Another part of the problem is that not all Southwestern cultures have an architectural form devoted explicitly to religion. Not surprisingly, Southwestern archaeologists have relied heavily on historic Pueblo religious architecture and organization as an analog for interpreting archaeological remains throughout much of the Southwest, including the Mogollon culture. But to what degree, if any, is this assumption appropriate to cultures other than the Anasazi, the generally recognized antecedents of the modern Pueblos? Accordingly, in this paper I prefer the more general term, socioreligious, when interpreting community-oriented structures in the Sierra Blanca/Roswell region.

Several authors have attributed ceremonial functions to certain structures in Jornada-Mogollon sites of south-central and southeastern New Mexico and adjacent parts of Texas (Figure 1). Lehmer (1948) outlines his thoughts for Mesilla and El Paso phase sites in the El Paso, Texas, region, as does Kelley (1984) for late Glencoe and Lincoln phase sites of southeastern New Mexico.

Since Kelley’s excavations in the 1950s and the publication of her 1966 doctoral thesis in 1984, several other structures have been excavated in the Sierra Blanca region and in the vicinity of Roswell. The rest of this paper discusses the evidence for interpreting them as socioreligious structures.

SITE DESCRIPTIONS

Nine structures in seven sites possess attributes that set them apart from the domiciliary structures at each location. These structures are described in this section. All but one of the sites represent two phases in Kelley’s cultural sequence, the Glencoe and the Lincoln phases. The cultural affiliation of the Fox Place is currently unassigned because the domiciliary architecture differs significantly from those defined for both the Glencoe and the Lincoln phases, the primary archaeological sequence of the Sierra Blanca/Roswell region (Kelley 1984).

The latter half of the Glencoe phase and the Lincoln phase are essentially contemporary and date between about A.D. 1200 or 1250 and 1400. The differences between the two phases involve geographic distribution, architectural preferences through time, and a series of minor differences in material culture and subsistence. Pottery assemblages are similar, but with different emphases. Following-up on implications tendered by Kelley (1984), I believe that the Glencoe phase people were the original inhabitants of the east slopes of the Sierra Blanca highlands and that Lincoln phase people intruded into the northern part of the Sierra Blanca/Capitan/Jicarilla highlands from the Gran Quivira region of central New Mexico. Although suggestions are currently tentative, sites representing both phases occur in the Roswell locale east of the Sierra Blanca highlands, but here, both may be intrusive.

It should be noted at the outset that domiciliary structures at most of these sites, whether Glencoe or Lincoln, share characteristics of shape and interior appointments but differ in others. As
Figure 1. Locations of sites with socioreligious architecture.
Figure 2. Floor plans of Sierra Blanca/Roswell region socioreligious structures.
Figure 2. Floor plans of Sierra Blanca/Roswell region socioreligious structures (cont.).
mentioned, the domiciliary structures at the Fox Place (LA 68188) near Roswell differ radically from those at Glencoe and Lincoln phase sites in that they are small and oval, rather than square to rectangular. The socioreligious structure and the pottery assemblage at the Fox Place conform quite well in most respects with those of the other sites. Floor plans, floor areas, and architectural details of each structure are presented in Figures 2 and 3 and Table 1, respectively.

Angus Site (LA 3334), Glencoe Phase

The Angus Site consists of an alignment of four pit rooms situated on a terrace of the Rio Bonito just downstream from the Crockett Canyon Site (Peckham 1971; ARMS files, Laboratory of Anthropology, Museum of New Mexico, Santa Fe). The original size of the site is unknown, since part of it may have been removed by early highway construction. Both the pithouse architecture and the pottery place the site in the late Glencoe phase, mostly after A.D. 1300.

The four rooms are shallow pithouses. All have hearths, indicating domiciliary use.

The floor areas of the three small structures range between 7 and 13 sq m. The largest structure, Feature 1, has a floor area of 35 sq m and floor features that clearly set it apart from the domiciliary structures.

The pottery assemblage, in order of abundance, is dominated by Jornada Brown, Chupadero Black-on-white, Corona Corrugated, Three Rivers Red-on-terracotta, and Lincoln Black-on-red. Selected minor types include Gila Polychrome and Rio Grande Glaze A. The status of El Paso Polychrome is not clear, but several vessels were recovered from the floor of one of the domiciliary rooms (Peckham 1971).

Bloom Mound (LA 1548), Lincoln Phase

The Bloom Mound pueblo site perches on a small bedrock knoll on the floodplain of the Rio Hondo, where that stream enters the broad Pecos Valley southwest of Roswell. It dates to the Lincoln phase, probably mostly between A.D. 1300 and 1400 (Kelley 1984; Roswell Archaeological Society n.d.). Although one of the domiciliary rooms has three floors, the site probably represents a single, perhaps long occupation.

The adobe-walled room block has about 10 rooms set in pairs in a north-south alignment. Room D/F, believed to be the socioreligious room, is a separate, deep structure lying immediately east of the pueblo. The depths of the pueblo room floors differed by as much as 1 m from one room to the next, but none is as deep as the large structure, evidently dictated in part by the depth of underlying bedrock. Some of the pueblo rooms have firepits, indicating residential use, while others lack them, suggesting a storage function.

The floor areas of the 10 pueblo rooms range between 5 and 12 sq m. Room D/F has a floor area of 35 sq m.

The pottery assemblage, in order of abundance, is dominated by El Paso Polychrome, Lincoln Black-on-red, Chupadero Black-on-white, Jornada Brown, and Corona Corrugated. Selected minor types include Three Rivers Red-on-terracotta, Rio Grande Glaze A, Gila
Figure 3. Floor areas of Sierra Blanca/Roswell region socioreligious structures.
Table 1. Attributes of Sierra Blanca/Roswell socioreligious structures.

<table>
<thead>
<tr>
<th>Structure No.</th>
<th>Angus</th>
<th>Bonnell</th>
<th>Bonnell</th>
<th>Crocket Canyon</th>
<th>Rocky Arroyo</th>
<th>Smokey Bear</th>
<th>Smokey Bear</th>
<th>Bloom Mound</th>
<th>The Fox Place</th>
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<tbody>
<tr>
<td>Placement</td>
<td>Integrated</td>
<td>Separate</td>
<td>Separate</td>
<td>Integrated</td>
<td>Separate</td>
<td>Separate</td>
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<tr>
<td>Size (L/W/D in m)</td>
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<td>6.5/6.5/6.6</td>
<td>7.1/6.6/5.1</td>
<td>6.5/6.4/2.1-3</td>
<td>5.1/5.1/1.7</td>
<td>6.0/6.0/2.0</td>
<td>8.0/7.2/1.5</td>
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<td>42.3</td>
<td>46.9</td>
<td>41.6</td>
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Note: * Data incomplete because of partial excavation.
Polychrome, Playas Incised, St. Johns Polychrome, and Galisteo Black-on-white.

**Bonnell Site (LA 612), Glencoe Phase**

This rather large Bonnell Site on a terrace high above the Rio Ruidoso saw several occupations during the Glencoe phase, starting in the late Pueblo III period and ending in the early Pueblo IV period (Kelley 1984). Rough calendrical dates are A.D. 1250 to 1350. The site has a complex history of occupations and reoccupations, with multiple floors in some structures and superpositioning of other structures.

Kelly (1984) excavated remains of 33 rectangular structures belonging to 4 occupations. Construction techniques included semisubterranean pithouses of varying depths and surface jacal structures. Both types of structures have hearths, indicating primary use as habitations. Pithouses were used throughout the occupation sequence, but the jacal-type structures tended to date to the later occupations.

Floor areas calculated from the site map (Kelley 1984:Map 9) reveal that 31 of the structures range in size from 5 to 24 sq m. Houses 1 and 15 (both pithouses), at 41 and 46 sq m respectively, are considerably larger; Kelly suggested they served as ceremonial chambers. But characteristic of the problems in defining specialized structures, Houses 1 and 15 lack floor and other features, so only size sets them apart from the other structures at the site.

The pottery assemblage, in order of abundance, is dominated by Jornada (or other) Brown, El Paso Polychrome, Chupadero Black-on-white, and Three Rivers Red-on-terracotta. Selected minor pottery types include Mimbres Black-on-white, Rio Grande Glaze A, St. Johns Polychrome, Ramos Polychrome, Gila Polychrome, Heshotauthla Polychrome, and Playas Incised.

**Crockett Canyon Site (LA 2315), Glencoe Phase**

The large Crockett Canyon Site is situated at the mouth of a major canyon tributary to the Rio Bonito (Farwell et al. 1992). Ceramic seriation suggests several occupations dating to the middle of the Glencoe phase or within the period A.D. 1200 to 1300. Perhaps because of the fairly large area available for use, the structures at Crockett Canyon are scattered over a much larger area than at the Bonnell Site. Complex stratigraphy is absent.

Nine rectangular structures were excavated. Construction techniques included both fully subterranean and semisubterranean pithouses. The latter structures were built on a slope sufficiently steep that the floors on the uphill side were nearly 1 m deep, but on the downhill side were nearly at the surface. Both types of structures have hearths, indicating primary use as habitations.

Floor areas range from 6 to nearly 42 sq m. Structure BB, the largest by 7 sq m, has two floor trenches that also set it apart from the other structures.

The pottery assemblage, in order of abundance, is dominated by Jornada Brown, El Paso Brown/Polychrome, Three Rivers Red-on-terracotta, and Chupadero Black-on-white. Selected minor types include Playas Incised, Mimbres Black-on-white, St. Johns Black-on-red/Polychrome, unspecified Casas Grandes polychrome, Corona Corrugated(?), and Lincoln Black-on-red.
The Fox Place (LA 68188), Undefined Phase

The Fox Place is situated on a natural levee of the Rio Hondo south of Roswell (Wiseman 1996a). Phase assignment and cultural affiliation are currently being evaluated, but archaeomagnetic dates, radiocarbon dates, and pottery types place the occupation(s) firmly within the period A.D. 1225 or 1250 to circa 1325.

Eleven structures were excavated or tested. Ten are very small, oval to subrectangular, semisubterranean pithouses with few interior features; one to three had small on-floor fire areas. The eleventh structure (Feature 10) is large, deep, rectangular, and fully subterranean.

Floor areas of the small pithouses reveal a tight range of sizes varying from 2.3 to nearly 4.7 sq m. Feature 10 is not only the largest at 18.5 sq m, it has several important floor and wall features that point clearly to a socioreligious function.

The pottery assemblage, in order of abundance, is dominated by Jornada Brown, Chupadero Black-on-white, El Paso Brown/Polychrome, Corona Corrugated, and Three Rivers Red-on-terracotta. Selected minor types include Playas Red Incised, St. Johns Black-on-red/Polychrome, Lincoln Black-on-red, Rio Grande Glaze A, Babicora Polychrome, Ramos Polychrome, and Gila Polychrome.

Rocky Arroyo Site (LA 25277), Glencoe Phase?

The medium-sized Rocky Arroyo Site, as with the Fox Place, is situated on a natural levee of the Rio Hondo south of Roswell (Wiseman 1996b). I know of the excavation details of only one structure. Aside from two other pit structures dug by local amateurs, at least two more pit structures and a large midden remain unexcavated. The occupation(s), tentatively assigned to the late Glencoe phase on the basis of the pit structures, is dated by the pottery assemblage to circa A.D. 1250 to 1325 or perhaps a little later.

Feature 2, the only excavated structure for which data are available, is a large, square, deep, fully subterranean structure with a floor area of 26 sq m.

The pottery assemblage, in order of abundance, is dominated by Chupadero Black-on-white, El Paso Polychrome, Three Rivers Red-on-terracotta, and Corona Corrugated. Selected minor types include Lincoln Black-on-red, St. Johns Black-on-red/Polychrome, Springerville Polychrome, Pinedale Polychrome, and Heshotauthla Polychrome, Santa Fe Black-on-white, and Playas Incised. Jornada Brown, a major trait of the Glencoe phase, is poorly represented, a fact that raises questions about the assignment of this site to that phase.

Smokey Bear Site or Block Lookout Site (LA 2112), Lincoln Phase

The Smokey Bear Site is situated on the top and upper slopes of a small, steep-sided hill located in the fork of two small creeks, both of which were probably either perennial or nearly so at the time of the prehistoric occupations. Limited professional excavations and reports of local amateurs reveal the site to have been complexly stratified and intensively occupied (Kelley 1984; Wiseman 1975; Wiseman et al. 1971, 1976). The major occupations at LA 2112 took place between circa A.D. 1250 and 1400. Small numbers of Mimbres Black-on-
white and Rio Grande Glaze F sherd indicate uses of the location as early as circa A.D. 1000 or 1100 and as late as the seventeenth century, respectively.

The primary architectural type is the small pueblo of 6 to 12 small, square, adobe-walled rooms arranged in single or double rows. Some pueblo rooms have hearths, and others do not, indicating both residential and storage functions. Large, fully subterranean, rectangular structures were set apart from the pueblos. As one small pueblo building fell into disuse and then ruin, the occupants shifted to another part of the hilltop and built a new one. The builders sometimes found themselves in the location of an earlier, ruined structure, whereupon they incorporated parts of the old one into the new one and razed those parts of the earlier structure that could not be renovated. As at Bloom Mound, some of the pueblo rooms have firepits, indicating residential use, and others, which lack firepits, were probably used mainly for storage.

Six pueblo rooms and one large, deep structure (Wiseman's Feature 4) were completely excavated, and a second large deep structure (Kelley's Structure 7/8) was trenched. The pueblo rooms range from 4 to nearly 10 sq m in floor area. The large, deep structures have floor areas of 36 and 57 sq m, respectively.

The pottery assemblage, in order of abundance, is dominated by Chupadero Black-on-white, Corona Corrugated, Jornada Brown, El Paso Polychrome, Lincoln Black-on-red, and Three Rivers Red-on-terracotta. Selected minor types include Rio Grande Glaze A (bichromes and polychromes), St. Johns Black-on-red/Polychrome, Playas Red Incised, Socorro Black-on-white, Gila Polychrome, Abiquiu Black-on-gray (Biscuit A), Springerville Polychrome, Heshotauthla Polychrome, Mimbres Black-on-white, Reserve Black-on-white, Santa Fe Black-on-white, Galisteo Black-on-white, Four Mile(?) Polychrome, Ramos Polychrome, and Rio Grande Glaze F (Kotyiti Glaze-on-red).

**FEATURES OF SOCIORELIGIOUS STRUCTURES**

Nine structures at seven sites in the Sierra Blanca/Roswell region are larger than the other structures at their respective sites and therefore merit consideration as possible socioreligious structures. As detailed below, all share certain features with the residential structures at the sites, but most also have one or more features that set them apart from the residential structures. These features are described below and are listed in Table 1.

**Placement of Large Structures Relative to Domiciliary Structures**

The placement of large structures vis-à-vis domiciliary structures in the villages involves two basic patterns. In Glencoe phase sites, the large structures are either incorporated within alignments of domiciliary pit rooms, as at the Angus and Crockett Canyon Sites, or they stand separately, such as Houses 1 and 15 at the Bonnell Site. The difference appears to be one of time subperiod, for at the Bonnell Site, the second recognizable period of occupation is characterized by two alignments of pithouses, evidently in mimicry of Lincoln phase pueblo buildings (Kelley 1984:311).

By way of contrast, all excavated large structures in Lincoln phase sites, Smokey Bear and Bloom Mound Sites, are located east of the pueblos. They probably also occur within the enclosed plazas of plaza
pueblos, such as the Block Headquarters Site (Kelley 1984:259).

Size and Depth

Structure sizes vary widely, though the important aspect is that they are the largest structures at their respective sites. The Fox Place structure, at 3.9 by 4.8 m (18.7 sq m), is the smallest, while Structure 7/8 at the Smokey Bear Site is the largest at 7.2 by 8.0 m (57.6 sq m).

Depths are also variable. At the Bonnell, Angus, and Crockett Canyon Glencoe phase sites the depths are within the same range as the residential structures and are best characterized as semisubterranean. Lincoln phase and unassigned structures—at Smokey Bear, Bloom Mound, and the Fox Place—on the other hand, are notably deeper than their respective residential rooms and are fully subterranean.

The size and depth of the Rocky Arroyo structures relative to other structures at the site is unknown. We have no details of the other structures other than knowing that the two excavated by the local amateurs are about the same size (one a little larger, the other a little smaller) and as deep as the documented structure. The two unexcavated rooms are, from surface appearances, both much smaller than these three structures.

Hearth/Fire Pit

All structures have a circular fire pit located in the approximate center of the room. These are generally cylindrical and average about 30 cm in both diameter and depth. In those structures with earlier and later hearths, the sizes and depths are more variable.

Ash Pit

Pits located east of the fire pits are in the position of so-called ash storage pits found in many Anasazi kivas (Kidder 1958:260–262; Smith 1972:117–120). However, not all Sierra Blanca/Roswell structures have these features, nor are they standardized in shape, construction, or use.

Glencoe-phase ash pits include one square, slab-lined example at the Bonnell 15; one rectangular example that had been subdivided into two parts with the west half slab-lined and the east unlined at the Angus Site; and one cylindrical example with a funnel-shaped mouth at Rocky Arroyo. All three are about the same size as the fire pits in their respective structures.

Lincoln phase and unassigned-phase ash pits include two shallow, circular to oval pits that are slightly larger than the fire pits in their respective structures at the Fox Place and Smokey Bear (Feature 4) Sites.

The Bloom Mound structure also possesses a pit east of the hearth, but this feature has a worn metate plastered into the opening. The metate has two grinding surfaces that were so heavily used that a hole was worn through the stone; this hole constitutes the mouth of the ash pit. Or could this feature represent a sipapu that is located in the wrong position with respect to the fire pit? Whatever it is, this feature is reminiscent of sipapus in historic Hopi kivas; these sipapus consist of a hole in a wooden plank set over a floor trench (Mindeleff 1891:131).

Main Roof Support Posts

All completely excavated structures have four main roof-support holes set into the
room interior from the corners. Sizes and depths are not considered significant here since they undoubtedly reflect the sizes and lengths of the available timbers.

**Auxiliary Posts**

Secondary posts vary in number from none to eight per structure and are presumed to have served as additional roof supports or as props for main posts or sagging roofs. Auxiliary post holes are smaller in diameter and shallower than the main support posts. The four structures possessing this feature are Bonnell (Houses 1 & 15) and Crockett Canyon at Glencoe phase sites, and Bloom Mound at a Lincoln phase site.

**Sipapu and/or Subfloor Offering**

The sipapu is the symbolic hole of emergence found in many Anasazi and modern Pueblo kivas (Kidder 1958:251-252; Mindeleff 1891:130-131; Smith 1972:120-121). Mindeleff was informed that not all kivas have sipapus because some are not consecrated and therefore do not require one. When sipapus are present in kivas, they are usually situated on the side of the hearth away from the ventilator (i.e., to the north or west of the hearth). And, most importantly, the actual form of sipapus and sipapu-like features evidently varied, some being simple holes and others consisting of a variety of materials and constructions, some of them quite elaborate. Kiva 7 at Pecos Pueblo, for instance, combined a stoppered hole, the sipapu in a rock slab with a covered jar of offerings underneath (Kidder 1958:Figures 53 and 55).

Some of the structures considered here were found to have either a hole or a carved stone imbedded in the floor in the position of the sipapu. The Angus structure has a small hole immediately west of the hearth. Both structures at Smokey Bear have a circular stone with a large, shallow hole ground into the top surface. The stones were sunken into the floor with the rims left flush to the floor surface. The stones appear to be about the same size; the one from Feature 4 is 14 cm in diameter, 6 cm thick, has a 17-mm-deep depression, and is made of crystalline aragonite.

Other structures evidently lacked a hole or stone in the sipapu position. However, excavation below the floors west of the hearths at both Rocky Arroyo and the Fox Place yielded surprises. At Rocky Arroyo, a hole with a diameter of 11 cm and a depth of 11 cm had been dug into caliche at the time of the construction of the structure but prior to laying the floor adobe. The hole was not plastered or otherwise finished in any manner and contained nothing more than the common silt of the floodplain. At the Fox Place, a freshwater mussel shell containing a turquoise pendant, a white shell disc bead and an olivella shell bead, was found in a small hole immediately below the floor plaster.

Since the hole in the Rocky Arroyo structure and the mussel shell and bead cache in Feature 10 at the Fox Place were both covered by the floor plaster, neither was seen or accessed by the Indians after construction was completed. Consequently, both phenomena are classed as offerings, perhaps consecrations, assuming that perishable items had been placed in the Rocky Arroyo feature.

Did the features in the Sierra Blanca/Roswell region structures described in this section serve the same purposes as sipapus in the Anasazi Pueblo world? We have no real way of knowing the answer to this question, particularly since the presence or
absence of the holes, stones, and subfloor offerings do not correlate by phase.

**Floor Trenches, “Drums,” and/or Loom Sockets**

Three structures possess either two or three floor trenches located near to and parallel with walls. All but one trench are 1 to 2 m in length. Widths vary from about 15 to 76 cm, with most being about 30 cm. Depths vary from 15 to 60 cm. The south trench at Rocky Arroyo was filled with melted adobe and was not excavated. Floor trenches occur at the Crockett Canyon, Angus, and Rocky Arroyo Sites and appear to be a Glencoe phase trait.

All but one of the excavated trenches contained fill identical to that of the overlying room fill at the time of excavation. Most are essentially identical with trench features found in some Anasazi kivas (Smith 1972:120–121). Covered with wooden planking, they could have served as resonators or foot drums when danced on during ceremonies. Some may have had sipapu holes in them as well (Mindeleff 1891; Smith 1972). One exception, the south trench in the Angus structure, contained the remains of a decayed log covered by floor plaster; a line of small holes in the plaster above the log suggests that this feature served as the bottom anchor of a vertical loom (Kidder 1958:252–257; Mindeleff 1891:128–129; Smith 1972:121–123).

**Ladder Holes**

Two structures, one Glencoe phase and one Lincoln phase, have two-pole ladder features. In the Angus structure, the holes are on either end of the slab that subdivides the ash pit. In the Smokey Bear structure, the paired holes are at the east edge of the ash pit. Charred stubs of both poles in the Smokey Bear structure angled 10-15 degrees westward from vertical, indicating the presence of a roof hatch over the fire pit.

**Ventilator System**

Fresh air was brought into most Anasazi pithouses and kivas through a unique ventilator system. This system was composed of an L-shaped configuration of horizontal tunnel and vertical shaft that connected the room interior through a hole in the wall at or near floor level with the ground surface outside the structure where fresh air could be taken in. A fire kindled in the firepit of the structure would create a vortex of rising warm air that would escape out the roof hatch overhead, causing cool air to be drawn through the ventilator and into the structure. A damper stone partially covering the interior opening of the ventilator, or a short vertical wall built on the floor between the ventilator opening and the firepit, would deflect the inrushing air to either side, causing it to circulate around the room. Upon warming, this air would then become part of the rising vortex of air, carrying some of the smoke from the firepit as it exited through the roof hatch.

Ventilator systems were noted in two structures of the Lincoln phase and one site of unassigned phase. In each case, the ventilators had small diameters and very short tunnels. Their structural weakness facilitated severe wall slumpage, making them difficult to identify at the time of excavation. Accurate measurements, observations, and drawings were not possible. However, the interior openings could not have been more than 15 to 20 cm in diameter, and the tunnel lengths were no longer than 25 cm. Thus, the distance between the vertical shafts and the surfaces...
of the walls would have been only 10 to 15 cm, or the approximate thickness of the plaster on the structure walls.

It is obvious from the archaeological evidence that the concept of a ventilating system was not particularly clear to the builders of the Lincoln phase structures. The diameters of the Sierra Blanca/Roswell ventilator systems were so small that they would have admitted very little air relative to the volumes of the roofed structures. This contrasts markedly with ventilators in Anasazi pithouses and kivas where ventilator diameters are frequently 50 cm or more in structures that are about the same size or smaller than the structures being considered here.

**Axial Alignment (Hearth-Ventilator Complex)**

Many Anasazi kivas have an alignment of floor and wall features called axial alignments or the hearth-ventilator complex (Kidder 1958:245). This alignment has several components, the three most consistent being the ventilator, the hearth, and the sipapu. Other associated features might include ladder sockets/holes, the deflector, the ash pit, and the katchina niche (Roberts 1932:60).

Five Sierra Blanca/Roswell structures possess hearth-ventilator complexes, though ventilators as such were not found in some of them. While these complexes occur in Glencoe, Lincoln, and unassigned-phase structures, structures of the other two groups have the most fully developed complexes, in that they have ventilator shafts and the Glencoe structures do not.

Of the two Glencoe phase examples, the alignment at the Angus Site has an ash pit, hearth, sipapu, and foot drum. The alignment at the Rocky Arroyo Site has an ash pit, hearth, subfloor offering pit, and foot drum. Both structures lack ventilators.

Two Lincoln phase examples include both structures at Smokey Bear. The Structure 4 alignment has a ventilator, two-post ladder, ash pit, hearth, and sipapu stone, while the Structure 7/8 alignment has a ventilator shaft(?), hearth, and sipapu stone. The Fox Place structure (phase unassigned) has a ventilator, ash pit, hearth, subfloor offering, and the serpent painting with its offering/feeding point (floor depression).

**Miscellaneous Features**

Several types of features occur at only one of the sites discussed here.

**Bench.** Structure 7/8 at Smokey Bear has a bench along all four walls. It is 70 cm wide, 70 cm high, and plastered with 5 to 10 cm of adobe. Map 9 of the Bonnell Site shows a bench along the west wall of House 15, but Kelley (1984:368) states that it was excavation error.

**Niche.** House 15 at the Bonnell Site has a floor-level niche in the south end of the west wall. It is circular, about 35 cm in diameter, and about 22 cm from bottom to top. It contained lumps of pinkish clay, yellow ochre, and red hematite stored between(?) two large El Paso Polychrome sherds. Mindeleff (1891:122) reports wall niches in Hopi kivas were used for ritual pipes and tobacco in earlier times, though by the late 1800s, virtually anything could be stored in them.

**Pit.** The floor of Bonnell 1 has two basin-shaped depressions, one of which is described on the map as being 15 cm deep.
and appears to measure approximately 60 by 40 cm. Function is uncertain.

**Pot-Rest Depressions.** A shallow, 24 by 18 cm, 9 cm deep, basin-shaped depression in the floor of the Rocky Arroyo structure may have supported round-bottomed pottery vessels.

**Wall Painting and Offering Point.** The Fox Place structure possessed a wall painting and associated floor depression (Schaafsma and Wiseman 1992). The painting is of a horned/plumed serpent presented in side-view, outlined in white paint with a green head and a black eye outlined in white. The head, facing south and centered on the west wall, has an open mouth, below which is a small, shallow depression in the floor plaster. This depression, measuring 12 by 8 by 1 cm, presumably served as an offering/feeding point for the serpent. The body of the serpent, represented by two parallel white lines, continued onto the north wall where it disappeared into a massive burned area created by the fire that destroyed the structure. Although the total length of the serpent’s body and details of the tail are unknown, the length of the serpent was 4.2 m at the time of excavation.

**DISCUSSION**

In his survey of Mogollon culture traits, Wheat (1955) found that ceremonial rooms are generally three to four times as large as the domiciliary or residential rooms. This is also true of Sierra Blanca/Roswell structures. Sierra Blanca/Roswell socioreligious structures are square to slightly rectangular in shape and are semi- to fully subterranean. This is in contrast to other types of kivas: prehistoric Zuni and Hopi D-shaped kivas with raised platforms, historic Hopi rectangular kivas, Mesa Verde key-hole shaped kivas, and Chaco and Rio Grande round kivas (Cattanach 1980; Judd 1964; Kidder 1958; Mindeleff 1891; Roberts 1932; Smith 1972). However, Sierra Blanca/Roswell structures also embody variability in attributes, some apparently relating to cultural affiliation phase and others evidently resulting from individuality.

 Culturally speaking, Glencoe phase structures often have foot drums (or floor trenches or weaving-loom anchors) and auxiliary roof-support posts. Lincoln phase structures lack floor drums and rarely have auxiliary posts, but they often have ventilator systems.

Features that occur with some frequency in structures regardless of phase include ash pits, sipapus/subfloor offerings, and, rarely, ladder post holes. This is also true of axial alignments or hearth-ventilator complexes. However, those in Lincoln and unassigned sites tend to be more complete in the sense that they have ventilators, and Glencoe structures do not.

Traits unique to single structures include a floor pit, wall niche, pot-rest depression, bench, and wall painting with associated offering/feeding point. The wall niche, bench, and serpent wall painting have potentially important ceremonial/ritual analogs in Anasazi and Pueblo kivas.

**CONCLUSIONS**

If we accept the premises set out by Watson Smith (1952) in his treatise “When is a Kiva?”, then we have good evidence for the presence of specialized, nondomiciliary architecture in the Sierra Blanca/Roswell region of southeastern New Mexico. Given the fact that the prehistoric remains belong
at least nominally to the Mogollon culture, rather than the Anasazi/Pueblo culture, I believe that we must allow for the possibility that the structures may have had social as well as religious functions, rather than strictly ceremonial functions as implied by the term kiva. Accordingly, I use the more general term of socioreligious for these structures.

All but one of the sites discussed in this paper belong to the Glencoe and Lincoln phases, as defined by Kelley (1984). Phase assignment for the Fox Place is currently pending. All sites date between A.D. 1200 and 1400. While I concur with Kelley's (1984) suggestion that the peoples of these two phases were ethnically separate, similarities in material culture suggest they were related to some degree. Both have socioreligious structures consisting of large, squarish rooms that were either semi- or completely subterranean, with a four-post roof-support system, and a centrally located firepit. Beyond the suggestion that some features have cultural/ethnic significance, such as foot drums/loom anchors in the Glencoe phase and ventilator systems in Lincoln phase, most traits are more unique in occurrence. The domiciliary residential architecture, pottery assemblages, other crafts, and subsistence practices of the two phases also share many traits.

Architectural sites in the Sierra Blanca/Roswell area have two basic types of structures—small rooms that are evidently domiciliary in nature and large rooms. The large rooms are believed to be specialized socioreligious facilities and share four basic traits: size, shape, a four-post roof-support system, and a central hearth. They are the largest structures in their respective sites, though the range in sizes is great (18.7 to 57.6 sq m).

Several of the unique architectural traits—benches, hearth-ventilator complex, sipapu, serpent painting—reported for Sierra Blanca/Roswell socioreligious structures are believed by Southwestern archaeologists to be strictly or mainly ceremonial in and of themselves. Or, they may be associated in a fundamental way with ceremonial behavior. Either way, the sporadic occurrence of these traits in Sierra Blanca/Roswell structures clearly indicates they were not essential to the social and/or religious activities performed in all of the structures.

Beyond structure size, roof-support system, and firepit placement, socioreligious architecture in southeastern New Mexico was clearly present but was not standardized beyond these basic features. It therefore follows that the religion practiced in prehistoric farming villages in prehistoric southeastern New Mexico was, most likely, not as elaborate, strictly controlled, and directed as was the case in the prehistoric Anasazi and modern Pueblos of northern New Mexico and Arizona.

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The expression of debts of gratitude for assistance and ideas in archaeological literature rarely acknowledge the people, institutions, and processes that operate behind the scenes to bring about critical funding and programs. Most of the information used in this paper derives from three basic sources, the archaeological data-recovery program undertaken at the Angus, Crockett Canyon, and the Fox Place Sites by the New Mexico State Highway and Transportation Department for the Federal Highway Administration; a long-term archaeological program initiated by Dr. W. C. Holden of Texas Tech University and completed by his daughter, Dr. Jane H. Kelley, at the Bonnell, Smokey Bear (Block

Regge N. Wiseman
Lookout), and Bloom Mound Sites; and the now defunct Roswell Archaeological Society at Bloom Mound. Without these programs, this paper would not even be a dream. Rob Turner of the OAS/MNM staff produced the graphics.

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ERRATA

The editors wish to extend apologies to Nancy H. Olsen for errors that appeared in her article, "Bandelier National Monument Pictographs and Petroglyphs: A Preliminary Study" in the 1995 volume of the Archaeological Society of New Mexico. Despite review by both of the editors and the author, omissions were made in the text. Material in brackets were provided by the author for clarification.

pg. 93, title, should read Pictographs

pg. 93, col. 1, line 3, should read Bandelier

pg. 104, Figure 6, should read "Eigenvalues of 12 motif categories."

pg. 105, Table 1, PI should read Pl.

pg. 108, col. 1, line 3–8, from "large cavates" to "Tsankawi Mesa and" should be deleted.

pg. 109, col. 1, line 5–7, should read, "In Figure 9 the Ungulate variable on the [negative vertical axis] opposes the Bird variable on the [positive vertical axis,]..."

pg. 109, col. 1, line 12, after "opening of", insert "large cavates in Frijoles Canyon and Tsankawi Mesa. Where Ungulates appear, Snakes, Handprints, and Other animals can also be expected to appear. Birds outside cavates appear only a fraction more often in Frijoles Canyon than on Tsankawi Mesa and"

pg. 110, col. 2, line 7. after "randomly," insert instead of rest of paragraph, "the alternative hypothesis (Ha) states that they will not be random and heterogeneously distributed."

pg. 110, col. 2, line 17, after "is 19.675," replace rest of sentence with "the null hypothesis (Ho) is rejected [and the alternative hypothesis (Ha) is accepted]."

pg. 112, col. 2, line 21, the correct Baddeley citation is 1982:200.