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The Archer M. Huntington Survey of the Southwest
The Aztec Ruin



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CLARK WISSLER

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INTRODUCTION

This volume is devoted to reports upon archæological investigations in and about a large Pueblo ruin near the town of Aztec, New Mexico. A large portion of this ruin, now a part of the Aztec Ruin National Monument, was uncovered and carefully studied and some of the results are presented in the following pages. These investigations were undertaken as one phase of the Archer M. Huntington Survey in the Southwest, the objective in this case being the intensive study of a large Pueblo site. The ruin was the property of Mr. H. D. Abrams from whom the Museum obtained permission to make excavations, provided the walls were left in good condition and so braced as to ensure their standing intact for several years. In 1920 the ruin and its immediate surroundings were purchased by the Museum with funds furnished by Mr. Huntington and two years later the property was deeded to the United States for designation as a National Monument which it became by proclamation of President Warren G. Harding, January, 1923.

The ruin was examined by Curator N. C. Nelson in 1915 and upon his recommendation, in 1916, permission was obtained from the owner to clear it of brush and weeds and to make trial excavations, the expense of this undertaking being borne by Mr. J. P. Morgan. By this time it became apparent that the complete excavation and repair of the ruin was desirable, both for the obviously procurable data on the culture of its ancient builders and that it might be preserved as a permanent exhibit. Accordingly, the project was made a part of the Huntington Survey and the responsibility for it given to Mr. Earl H. Morris.

The accompanying papers present the results in part: a preliminary description of the specimens found in the ruin with comments upon the chronological place of the site, a special study of the unusually large kiva in the court, data upon the burials and rooms excavated, and finally, the results of excavations outside the main ruin. Much remains to be covered in future publications, but since three fourths of the ruin was cleared, the walls protected, and two kivas restored, one of the important contributions lies in the exhibit which is now a National Monument where architecture and other important culture problems may be studied first hand.

The ruin excavated was but one in a group of six, and in 1923 the Museum purchased sufficient additional land to enclose the other five ruins and presented this to the United States Government as an extension of the Aztec Ruin National Monument. No systematic excavation was

made before transferring this second gift to the Government, but since the entire group will now be protected and conserved, it is the hope of the Museum that all the ruins will be completely excavated to stand as a permanent exhibit of prehistoric Pueblo culture.

CLARK WISSLER.

December, 1929.

ANTHROPOLOGICAL PAPERS
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—
THE AZTEC RUIN

BY

EARL H. MORRIS



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THE AZTEC RUIN

By EARL H. MORRIS

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INTRODUCTION

The Aztec Ruin is the principal member of a large group of pre-historic Pueblo remains situated in the valley of the Animas River about one mile north of the town of Aztec, county seat of San Juan County, the most northwesterly political division of the State of New Mexico. The Animas River, having its origin among the perpetual snows of the La Plata Mountains of southern Colorado, crosses the New Mexico line, and then flows some thirty miles in a southwesterly direction to join the San Juan River, a mighty tributary, which after hundreds of miles of tortuous windings pours its turbid flood into the Rio Colorado.

About fifteen miles above its mouth the Animas has swung obliquely across its valley, leaving a broad terrace upon the northwestern bank. At a point somewhat nearer to the gravelly foothills than to the river bed, the vast heap of masonry known these many years as the Aztec Ruin, raises its stately bulk above the gently sloping surface of this terrace. The geographical location of the ruin is approximately 108° West Longitude, and 36° 45" North Latitude. Its elevation above the sea is some 5,700 feet.

Originally, owing to scanty and uncertain rainfall, the Animas Valley was rather barren and desolate. A narrow fringe of deciduous growth, composed of willows, skunk brush, squaw or buffalo berries, and cottonwoods, skirted the river banks, while the gray expanses intervening between the watercourse and the uplands were clad with an intermittent growth of pale green sage and chico brush. In the distance, clayey hills, cut through with occasional sandstone strata, rear their yellow crests above a ragged forest of black-green piñon and cedar.

Although barren, the Animas Valley offered one of the most ideal situations in all the Southwest for Pueblo occupation. Occasionally the temperature falls to zero or below, but in the main, the winters are mild and replete with bright cloudless days. The groves of cottonwoods along the river, and the piñon and cedar forests in the neighboring hills furnished a plentiful supply of timber for fuel and for building purposes. The indispensable yucca plant grew in relative abundance upon the uplands, and wild foods such as skunkberries, squawberries, cactus fruits, and piñon nuts were to be obtained in plenty during favorable seasons.

Deer ranged among the foothills, and antelope grazed over the open country a few miles to the southward. Mink, beaver, and muskrats

frequented the river, and wild ducks and geese paused in their migrations to feed among the marshy places. Jack-rabbits, cottontails, and prairie dogs were numerous among the sage-covered flats, and the breaks of the foothills. But, more important than all else, the Animas was, and still is, an unfailing stream, and the lands of its barren, but by no means sterile valley, needed only the quickening touch of moisture to transform them into veritable gardens. The Pueblo were old in the art of irrigation, and when their canals were once completed, the fields repaid them for their labors with ample crops of beans and maize.

It seems improbable that the chimerical eldorado which lured the Spanish conquerors into the most remote corners of the Southwest should have failed to lead them past the ruined pueblos in the Animas Valley, and as they were tolerably diligent recorders of what they saw, one would expect to find some reference to these ruins among the works of the early chroniclers. However, in the translations now available, there is no mention of the ancient habitations, and if Spaniards were the first to discover them, the information we so covetously desire is hidden away in some musty pile of manuscript.

On the fourth day of August, 1859, J. S. Newberry visited the site to which the name of Aztec Ruin was later applied, and if he was not the first white man to behold the impressive aboriginal monuments, he appears to have been the first to leave written records of them. Because of the historical interest which attaches to it, his account will be quoted in considerable detail:—

August 4th.—Left Camp early with Pfeifer, the Indian agent, Messrs. Fisher and Dorsey, and several Indians to visit the ruins reported to exist at a certain point on the banks of the Animas. . . . Below this (canyon) the valley widens, and the declivities which bound it become more gentle; the bottom-lands are from a mile to two miles in width, and quite fertile; the river is bordered with thickets of willow and buffalo-berry, with groups and sometimes groves of cottonwoods. It is in this part of the valley that the ruins are situated. The principal structures are large pueblos handsomely built of stone, and in a pretty good state of preservation. The external walls are composed of yellow Cretaceous sandstone, dressed to a common smooth surface without hammer-marks; in some places they are still 25 feet in height. As usual in buildings of this kind, the walls were unbroken by door or window to a height of 15 feet above the foundation. The interior shows a great number of small rooms, many of which are in a perfect state of preservation, and handsomely plastered. These structures are surrounded by mounds and fragments of masonry, marking the sites of great numbers of subordinate buildings; the whole affording conclusive evidence that a large population once had its home here.¹

¹*Report of the Exploring Expedition from Santa Fé, New Mexico, to the Junction of the Grand and Green Rivers of the Great Colorado of the West, in 1859* (Washington, 1876), 79-80.

On July 22, 1878, Lewis H. Morgan visited the site, made a fairly thorough examination of the Aztec Ruin, and subsequently published a good description, and a reasonably accurate groundplan of the great pueblo.¹

Although referred to by several other authors, nothing more of consequence was written concerning the Aztec Ruin prior to 1916, when its systematic exploration became an imminent probability. The Handbook of American Indians makes no mention whatever of any prehistoric remains in the Animas Valley.

The first white settlers established themselves in the lower Animas Valley about 1876. For a few years thereafter the fallen and exposed walls of the ruins furnished an easily obtainable supply of building material, and considerable quantities of stone were hauled away for the erection of foundations and chimneys.

In the spring of 1882 a drift was driven into the northwest corner of the ruin at a point where the contour of the mound gave evidence of standing ceilings beneath the surface débris. Nine rooms on the ground floor were opened. Seven of them contained nothing but a shallow deposit of dust and sand sifted in by wind and rain before the falling of the upper walls sealed the doors and ventilator openings. In the eighth room there were two skeletons; one flexed, wrapped in cloth and matting, and bound with a heavy cord; the other with bones held in place by dried ligaments, kneeling in one corner, with head tilted back against the wall.

Thirteen skeletons covered the floor of the remaining chamber. Accompanying them were many pottery vessels, baskets, sandals, cloth, and a wealth and variety of objects, presumably mortuary offerings, whose exact nature and extent it seems impossible to determine.

A patent covering the site of the Aztec Ruin was issued to John R. Koontz in 1889, and it continued in his possession until 1907, when it was transferred to H. D. Abrams, the present owner. Thanks to the efforts of these gentlemen, during the period of their ownership, the ruin has been to a great extent protected from vandalism. Some despoliation has been unavoidable. Unscrupulous curiosity seekers have cut out and carried away many pieces of timber, destroying doorways by tearing out the lintels, and weakening the ceilings by removing the beams. Heedless visitors have inscribed their names in every conceivable place.

¹ *Contributions to North American Ethnology*, vol. 4, Washington, 1881.

But in spite of such minor depredations, the Aztec Ruin is in a much better state of preservation than any other structure of its kind in the entire Southwest.

Mr. N. C. Nelson of the Department of Anthropology of the American Museum of Natural History, examined the ruin in the fall of 1915, and after his return to New York recommended its systematic exploration. Fortunately, President Henry Fairfield Osborn had previously become interested in the site, and in consequence, Mr. Nelson's recommendation met with a ready and favorable response.

Early in 1916, Mr. H. D. Abrams granted to the Museum the right to excavate upon decidedly liberal terms, and in July of that year work was actually begun. The field season of 1916 was brief, terminating at the end of August. Excavations were resumed June 10, 1917, and continued on an extensive scale until the twenty-fifth of November. As this is written (May, 1918), the third expedition is preparing to return to the field to resume the excavations.

In July, 1916, when the Museum's party arrived at Aztec ready to begin the initial stages of the contemplated explorations, the ruin resembled nothing more than a patch of jungle rising in the midst of cultivated fields. Alfalfa was growing upon the north, south, and east sides, while on the other side of a fence which skirted the western base of the mound stood a young and flourishing apple orchard. The refuse mounds at the southeast and southwest corners, as well as a strip of varying width bordering the alfalfa fields, supported a rank growth of sunflowers and other weeds, in places at least eight feet high. A thicket of chico brush hid the court and the contours of the four structures which surround it, the walls of the central portion of the north wing alone being visible above the tangled vegetation (Fig. 1). Trails connected the various openings that gave access to the chambers with intact ceilings which had been burrowed into by relic hunters years previously, but for the most part, the area was impassable except to those clad with sufficiently heavy garments to resist the thorns, or to those resigned to endure the itching torment which results from the slightest abrasion of the skin by the twigs of the chico.

After the brush had been cut, piled, and burned, it was possible to obtain a fairly definite conception of the ruin with a single sweep of the eye (Fig. 2). Three long mounds, marking the sites of the east, west, and north wings, enclosed three sides of a rectangular court which was bordered on the south by a low crescentic embankment concealing the remains of an arc-shaped row of rooms. Most of the mound covering

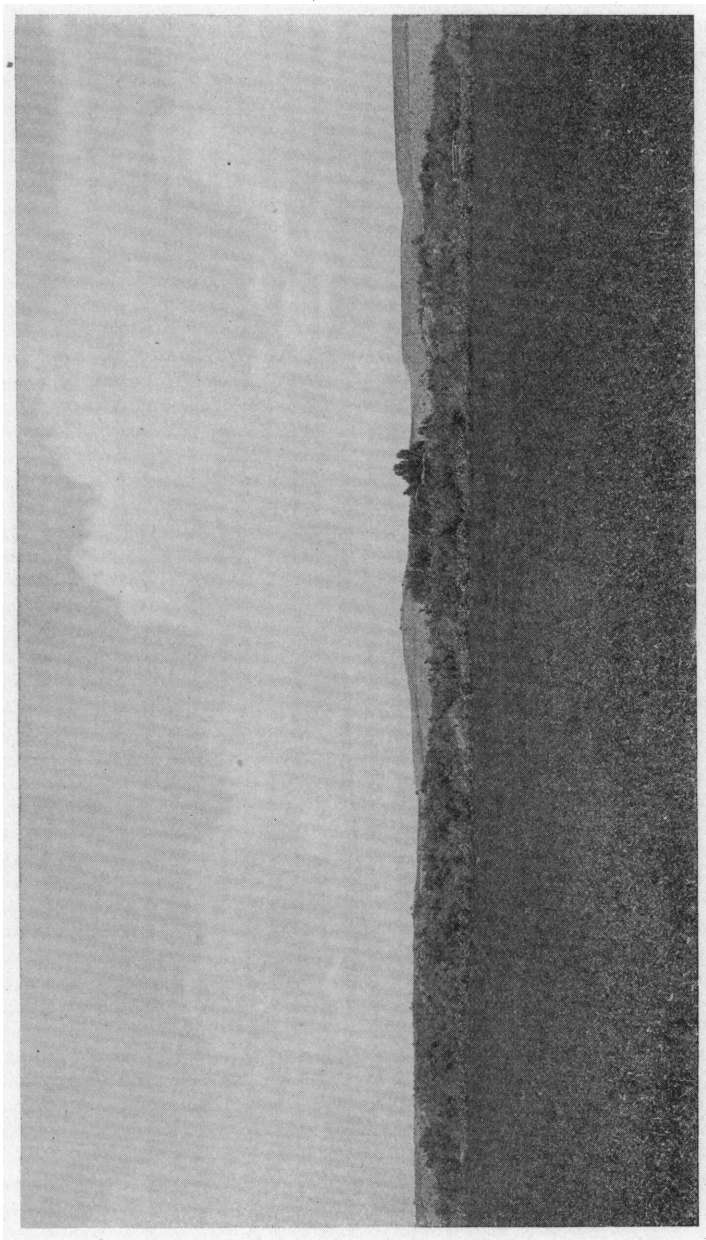


Fig. 1. The Artec Ruin from the South before Clearing.

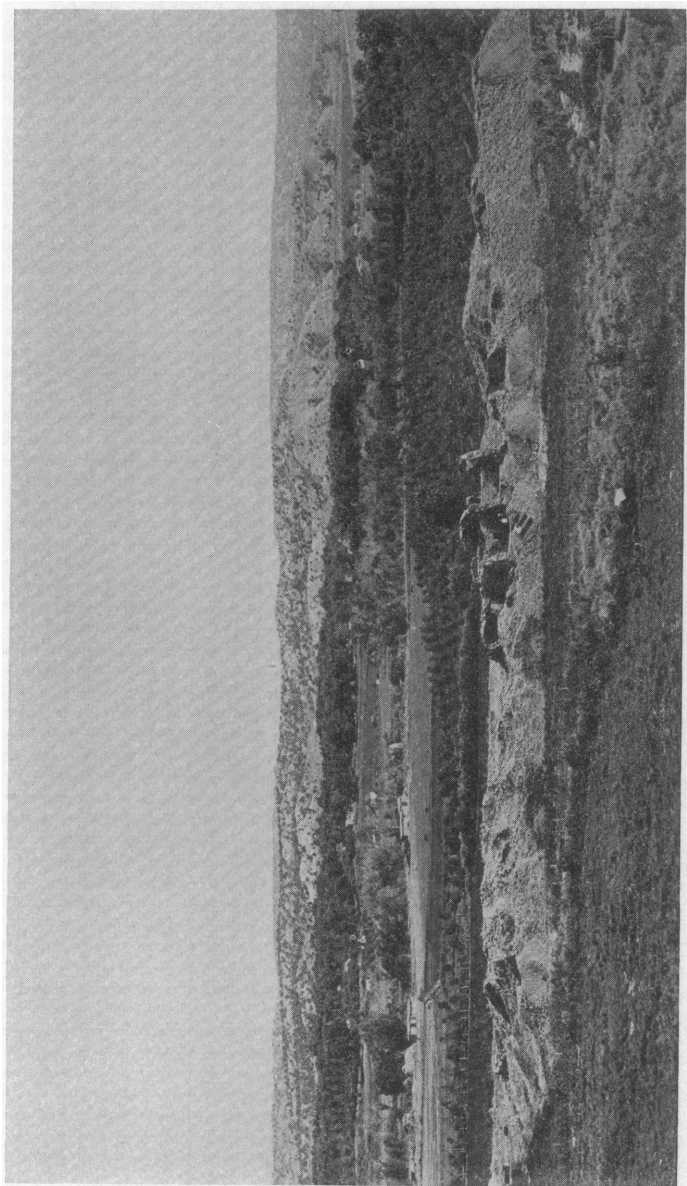


Fig. 2. The Ruin after Clearing.

the west wing stood twenty feet high, while the walls of the north wing rose in some places twenty-nine feet above their original foundations. The mound of the east wing varied from five feet in height at its junction with the south wing, to twenty feet at its northern extremity.

The main outline and gross dimensions of the groundplan were apparent before excavations were begun, showing the ruin to have been a structure roughly 359 by 280 feet, built about a court whose approximate dimensions are 180 by 200 feet. At the close of the field season of 1917, sixty-nine secular chambers and eight kivas, or ceremonial chambers, comprising the eastern end of the south wing, the entire east wing,

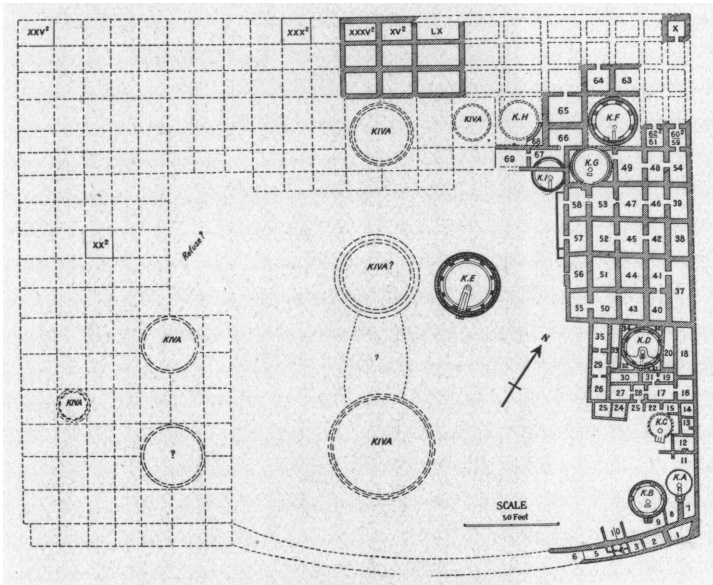


Fig. 3. Groundplan of the Aztec Ruin.

and a portion of the north wing, stood completely freed of débris. The excavated area is indicated by the shaded walls in the map appearing in Fig. 3.

The east wing was abandoned long before some other quarter of the building ceased to be inhabited, and subsequently the rooms which compose it were used as repositories for refuse, that is, house sweepings, ashes, animal bones, potsherds, etc. Some of the chambers contained as much as ten feet of this material. Burials were found in rooms 1, 2, 18, 29, 33, 41, 45, 52, 56, and Kiva B. There were also bodies in Kiva D,

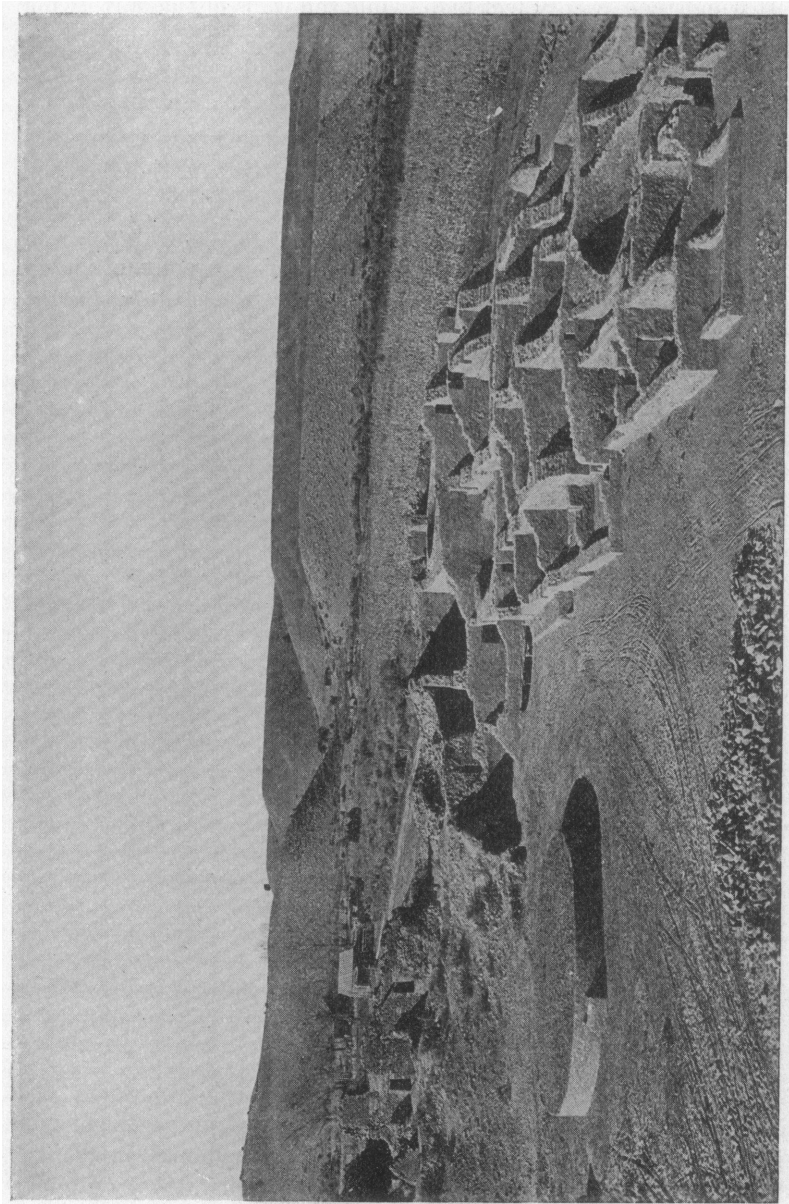


Fig. 4. Detailed View of the Aztec Ruin from the South.



Fig. 5. Crushed Pottery Vessels found in Room 41.



Fig. 6. Dry Refuse in Room 45.

but these were the remains of individuals who were cremated during the conflagration which destroyed the roof of the council chamber. Fire had consumed the ceilings of all but four of five of the rooms which have been excavated thus far.

As the purpose of these paragraphs is merely to provide the reader with a background for the facts of material culture brought out by the description of the specimens to which this paper is devoted, the details of excavation will be omitted from the present publication.

DESCRIPTION OF SPECIMENS.

Climatic features at Aztec, and the massive walls and durable ceilings of the rooms have conspired to provide exceptionally favorable conditions for the preservation of specimens. In many places not a drop of moisture has penetrated in all these centuries with the result that fibrous, and therefore perishable materials, have undergone little more alteration than would have resulted had they been hermetically sealed from light and dampness. In consequence, the specimens which have been exhumed from perhaps one-fourth of the pueblo may be considered as illustrative of practically all of the arts and crafts of its former inhabitants.

For purposes of description these specimens are grouped into the following classes:—

1. Stone Implements.
2. Bone Implements.
3. Wood and Wooden Artifacts.
4. Textiles and Objects of Vegetable and Animal Fiber.
5. Objects of Unburned Clay.
6. Pottery.
7. Beads and Ornaments.

Such an arrangement is not altogether devoid of logic. Implements of stone and bone were the tools used in practically all mechanical processes, and although themselves constituting an integral part of the material culture complex, to a great extent they conditioned the rest of the complex, and being thus more fundamental, may justly be given initial position in the description that is to follow.

Of vegetable materials, wood required less elaboration to reduce it to the desired forms than did grasses, reeds, and separated fibers which were fashioned into textiles and related types of objects, so naturally these two categories fall into first and second places in relation to each other, or second and third in our series.

The practice of ceramic art involves a knowledge and application of diverse mechanical principles whose successful synthesis for the attainment of a given end places pottery-making in a high position in a rational evolutionary series, easily in advance of work in stone, bone, and the more elemental textiles.

The manufacture of such excellent beads and articles of personal adornment as here present themselves for consideration, demanded the mastery of a technique, not necessarily more complicated, but considerably more difficult, than that involved in pottery-making. Moreover, the finished objects were intended to satisfy an aesthetic demand and were in no wise utilitarian. This fact, together with the masterly skill of their construction, sets beads and articles of personal adornment apart as the most advanced material accomplishment of the ancient Pueblo. Hence, as a class, they constitute the last category in our descriptive series.

STONE IMPLEMENTS

Pecking Stones. Because of their close resemblance to the fractured boulders so common in the river drift, superficially, pecking stones are the least readily distinguishable stone implements from Aztec. Closer examination shows them to constitute a definite type. They are found in considerable numbers in the small outlying ruins and occasionally come to light within the great pueblo itself.

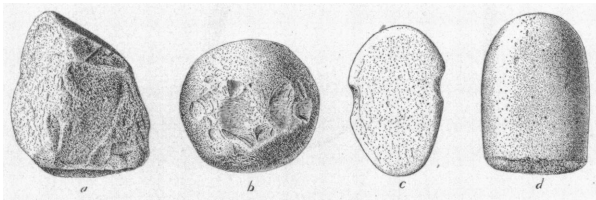


Fig. 7. *a* (29.0-5195), *b* (29.0-8022), *c* (29.0-7092), *d* (29.0-7541). Pecking and Pounding Stones and a Grooved Ax. *a*, shows little wear from use, Room 5, South Wing; *b*, reduced to a sphere from continued use, Kiva I, North Wing; *c*, made from a crude river boulder, Room 70, East Wing; *d*, from Room 48, East Wing.

Spherical, globular, or ovoid boulders of quartzite, or rock of comparable hardness and fracture, averaging somewhat larger than a good-sized orange, were chosen for their manufacture. Large chips were struck off from two or more converging slopes of a stone, leaving sharp jagged points and edges. The original curving surface of the opposite side fitted conveniently into the half-closed hand and was easily grasped. In this fashion, the crude, but effective, tools were used to reduce other stones to the desired form for implements or building purposes. Several of the more specific functions of pecking stones are evident. They were utilized to roughen the grinding surfaces of metates, to block out manos

and stone slabs, to excavate the bowls of mortars, to mark out the grooves of axes and hammers, and above all, to dress the faces of building stones.

Some of the pecking stones show little or no wear (Fig. 7a), while the striking surfaces of others have been abraded by long use, until the stones have been reduced to almost spherical form (Fig. 7b).

Pounding Stones. A few stone objects seem to have been used more specifically for pounding than for pecking. Only three are present in the collection and this small number will not warrant much generalization. A representative specimen (Fig. 7d) is $3\frac{3}{4}$ inches in length and oval in transverse section, $2\frac{1}{16}$ by $1\frac{1}{8}$ inches. Both ends show the effects of pounding.

Rubbing Stones. Rubbing stones were made from pieces of sandstone found in the river gravel. They are square, rectangular, circular, and kidney-shaped in outline. Fig. 8a is $3\frac{3}{4}$ inches square by $\frac{1}{2}$ inch thick; Fig. 8b is $2\frac{1}{8}$ inches in diameter and $\frac{3}{4}$ inch thick. With one

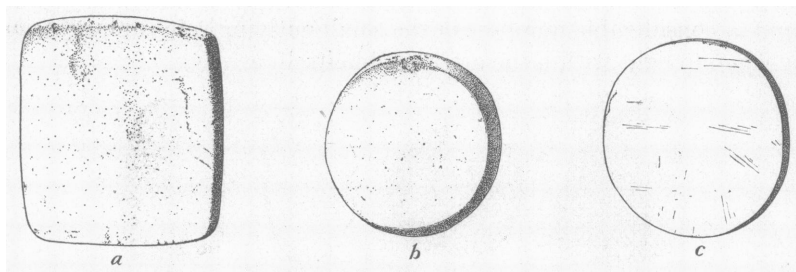


Fig. 8 a (29.0-7096), b (29.0-7467), c (29.0-5148). Rectangular and Circular Rubbing Stone and a Polished Stone Disk: a, from Room 50, East Wing; b, from lower level Room 65, North Wing; c, from Room 1, South Wing.

exception, the worn surfaces of these stones indicate that they were used in rubbing or grinding flat surfaces. The one exception has a broad depression worn across one face. It is the relative coarseness of the grit of these stones that justifies their separation from polishing stones.

Polishing Stones. For use as polishing stones, fine-grained pebbles of extreme hardness were selected from the river gravel. Some are subspherical in form, some egg-shaped, until at the opposite end of the series, the stones are sufficiently flattened to be rectangular in cross-section. In some cases, all surfaces have been highly polished by continual use; in others, only the two larger exposures show signs of wear. More rarely abrasion due to wear has produced a flat surface and occasionally the worn surfaces are curved. Sixteen of this series retain their

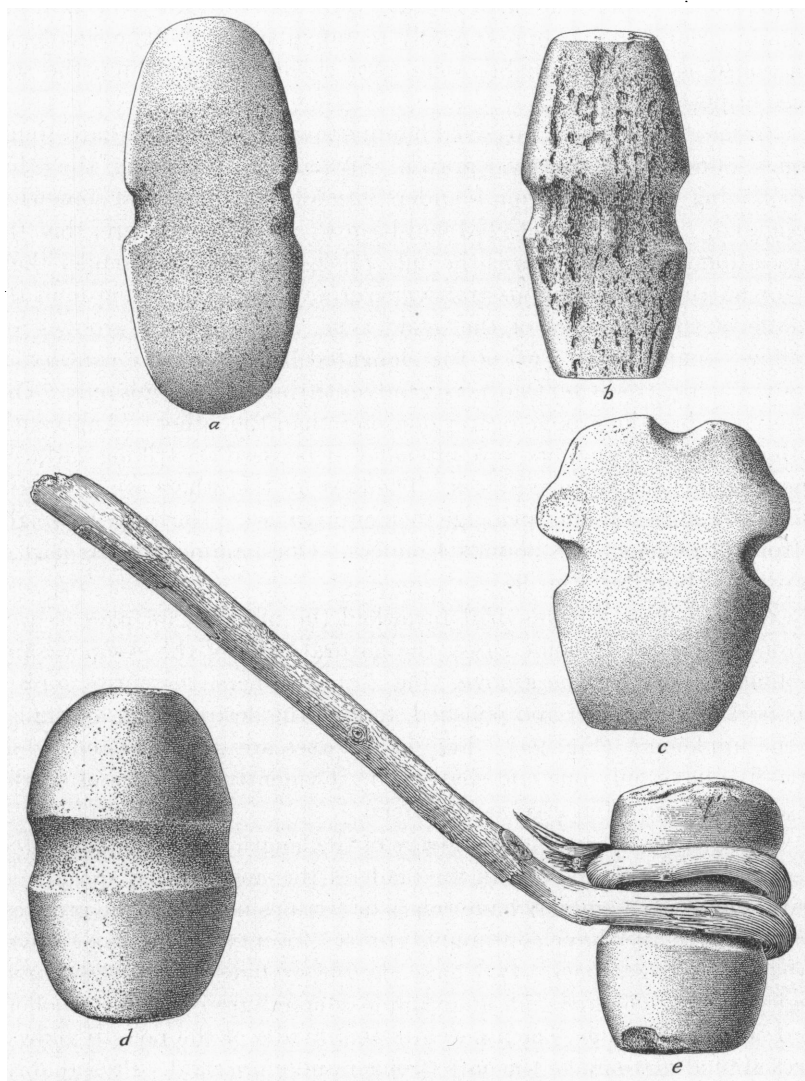


Fig. 9. *a* (29.0-5428), *b* (29.0-6761), *c* (29.0-7136), *d* (29.0-7298), *e* (29.0-7537). Types of Axes and Hammers. *a*, double-bitted ax with all surfaces worked, Ventilator Tunnel, Kiva A; *b*, double-faced hematite hammer, Kiva D, East Wing; *c*, grooved ax with additional notch through pole, Room 51, East Wing; *d*, double-faced grooved hammer, Room 49, East Wing; *e*, grooved hammer retaining original haft, Room 48, East Wing.

original form, save as modified by use; the other three have been intentionally ground to an approximately rectangular form. The smaller of the polishing stones probably were used chiefly in smoothing the surfaces of pottery vessels.

Grooved Hammers. Grooved hammers were made from hard tough stones found among the river gravel. Five are of ovoid form, the other four having been made from boulders laterally flattened and somewhat elongated. The stones selected had been so shaped by nature, that the excavation of the groove was the only process necessary to render them fit for hafting. Continuous transverse grooves were pecked around the middle of the hammers of the ovoid type. Some of the grooves are shallow; some deep. Two of the elongated hammers have continuous grooves; while the other two have grooves through the edges only. This latter type has the groove nearer one end than the other. Apparently both ends of the hammers were intended to be used as striking surfaces. One, Fig. 9d, has flattened faces. The faces of the others are unworked except for abrasion and breakage incidental to use. The range in weight is from 14 ounces to 28 pounds 4 ounces. One hammer retains part of its original handle (Fig. 9e).

Grooved Axes. River drift furnished the material for axes as well as for hammers. In some cases, the natural form of the stone was unmodified, except for the groove, (Fig. 7c), in others, the entire surface was pecked, or pecked and polished, to give the desired form and finish to the implement (Fig. 9a). Five of the axes are double-bitted, while forty-five have only one end sharpened. Evidently the poles of single-bitted axes were often used as hammers.

The grooves were placed midway of the length of the double-bitted axes, and nearer the pole than the blade of the single-bitted specimens. Neither axes nor hammers have ridges or ferrules bounding the grooves. Twenty-three axes have continuous grooves; twenty-seven have grooves through the edges only; two have double grooves; forty-eight have single grooves. There is not an example of spiral grooving in the collection. One ax, Fig. 9c, has a notch in the middle of the pole to allow a vertical binding to make the haft stronger and more rigid. Presumably, the general method of hafting was the same for axes as for hammers (Fig. 9e).

The range of weight of the axes is from 5 ounces to 4 pounds 7½ ounces.

Axes with rough or blunt bits probably were used for quarrying and blocking out building stones, metates, slabs, etc. The sharp, relatively

keen-edged ones, were the tools with which timber was cut, the marks being very plain upon the knots and ends of ceiling beams.

Dressed Slabs. Slabs that have been worked to the desired form but have not been smoothly finished are characterized as dressed slabs to distinguish them from similar objects with polished surfaces. There seem to be three recognizable groups of dressed slabs, the basis of separation depending upon the relative size. The largest ones presumably were doors and are rectangular in form. A representative one is $34\frac{1}{2}$ by $24\frac{1}{2}$ by $\frac{1}{16}$ inches. Usually, one of the surfaces has been made smoother than the other. A characteristic specimen of the medium-sized slabs is 9 by 11 by $\frac{1}{4}$ inches. The corners are somewhat rounded. Slabs of this sort are found occasionally with the dead, but there is nothing to indicate their function definitely. One of the smallest group measures $3\frac{3}{8}$ by $6\frac{1}{2}$ by $\frac{1}{16}$ inches. The function of these smallest slabs has not been determined. As is the case with the door slabs, both smaller series have one side worked smoother than the other.

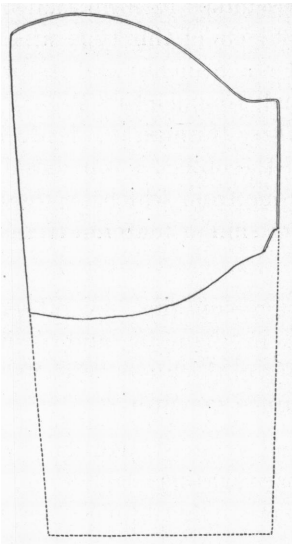


Fig. 10 (29.0-5216). Polished Stone Sandal Form, from Room 15, East Wing.

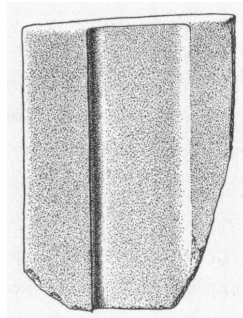


Fig. 11 (29.0-5186). Small Polished Slab resembling Miniature Metate. From Room 2, South Wing.

Polished Slabs. Two large, relatively thick, polished slabs were found in Kiva B. The larger of the two is $18\frac{1}{2}$ by $7\frac{3}{8}$ by $1\frac{1}{16}$ inches. All surfaces have been polished as highly as the grain of the stone would permit. Both upper and lower surfaces have been slightly hollowed out

as if some substance were ground or some object sharpened upon them. One of these depressions shows traces of red pigment. It is possible that in the manufacture of hematite implements and paint sticks, which seem to have been reduced to the desired form by rubbing, the work was done upon stones of this sort. The flat or slightly hollowed surface served to catch the dust which was saved for use as a coloring matter. The smaller of the slabs from Kiva B is $13\frac{1}{2}$ by $6\frac{1}{2}$ by $1\frac{1}{2}$ inches. The general description of the size of the former will suffice for this one also. One polished slab, revealing excellent workmanship is $8\frac{1}{2}$ by 8 by $\frac{5}{8}$ inches. It was presumably of rectangular form, one end having been broken. All surfaces have been polished to a remarkable degree of smoothness and the angles are as true as if the eye of the workman had been aided by a square. The other polished slabs are relatively thin, $\frac{1}{4}$ inch being a fair average. In general, they are rectangular in form, although in some cases the sides are slightly curved and the corners rounded. In size, they range from 2 by $3\frac{1}{2}$ to $9\frac{1}{4}$ by 15 inches. There is one fragmentary polished slab of which the upper half resembles in form the so-called sandal lasts, but it is larger than other objects of this type which have been observed. Its width at the shoulder is 8 inches and its probable length about 15 inches (Fig. 10). A small fragmentary slab (Fig. 11) has a trough-like groove worn about halfway through it. Its form suggests a miniature metate. The length of the object is 3 inches and the width of the groove 1 inch. The sandstone from which all these slabs are made is not local. There are ledges of similar material from twelve to twenty miles distant.

Polished Stone Disks. The collection contains several polished stone disks, varying in size from $2\frac{1}{4}$ inches in diameter and $\frac{7}{32}$ inch in thickness to 5 inches in diameter, $\frac{3}{16}$ inches in thickness (Fig. 8). One is of black slate; the others are of fine-grained sandstone.

Arrow-straightener. There is but one arrow-straightener in the collection. This is a rectangular bit of coarse-grained sandstone, $1\frac{1}{2}$ by $3\frac{1}{8}$ by $\frac{5}{8}$ inches. A shallow groove extends longitudinally across one surface.

Skinning Knives or Tcamahias. Four skinning knives or *tcamahias* have been found in the part of the ruin excavated. All of these are from the dilapidated cobblestone structure comprising the southeast corner. Only a few fragments of *tcamahias* have been taken from the main building and these were among the refuse that had been thrown into abandoned rooms.

In the small ruins of the Aztec Region *teamahias* are fairly abundant. Should it be borne out they do not occur in the great pueblo, it will mark the absence of a culture trait highly characteristic of some subdivisions of black-on-white time in the upper San Juan Region.

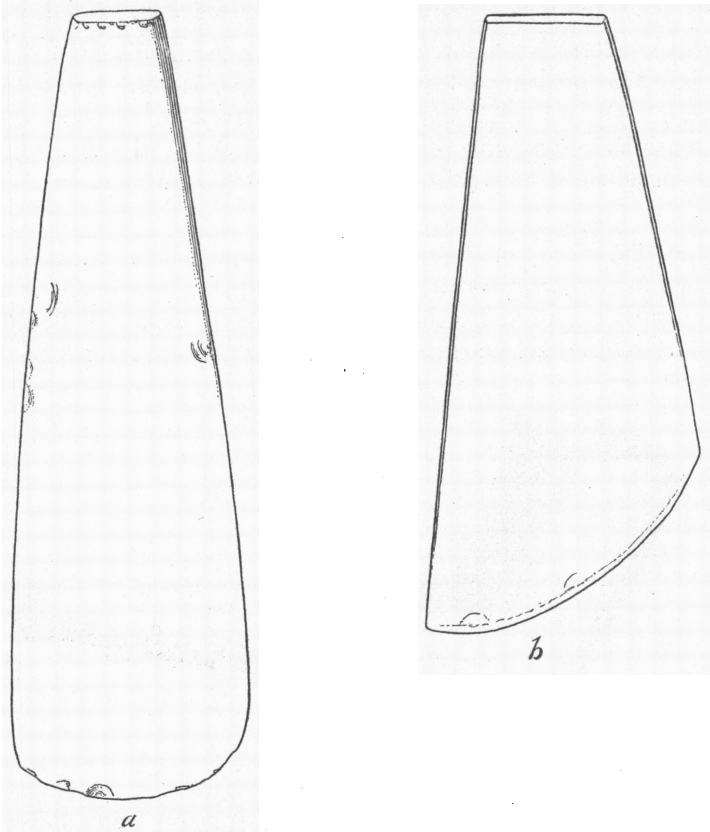


Fig. 12a (29.0-5427), b (29.0-5147). Two Types of Skinning Knives or *Teamahias*. a, from Ventilator Tunnel, Kiva A; b, from Room 1, South Wing.

Two types of *teamahias* are represented by the four specimens; two tapering chisel-shaped implements, with the axis of the blade at right angles to the long dimension of the stone Fig. 12a; and two with sharpened edges running obliquely backward towards the handle end of the implements (Fig. 12b).

Three are of gray to yellow hornstone, the other of what is presumably black slate. Neither hornstone nor slate are local materials. The range of length of the implements is from 5 $\frac{5}{8}$ to 9 $\frac{1}{2}$ inches.

Although these objects are used among the Hopi and at Zuni on the altars in certain ceremonies, they certainly were originally intended for actual use. The blades often are chipped and broken or have been re-ground. A few from the Aztec vicinity show unquestionable marks of hafting, although none of this sort are in the present collection.

Pipes. Pipes are relatively rare among specimens from the Aztec Region. The present collection contains two tubular pipes, both incomplete. One is of a fine-grained, relatively hard, homogeneous, pink material resembling pipestone in texture. The other somewhat larger specimen is of steatite. Neither of these materials is of local origin.

One elbow pipe of unquestionable antiquity was found in a ruin three-eighths of a mile south of the Aztec Ruin. It is made of burned clay, mottled brown and black in color and is $3\frac{1}{4}$ inches in length (Fig. 13). The exterior has an excellent polish and the interior has been much

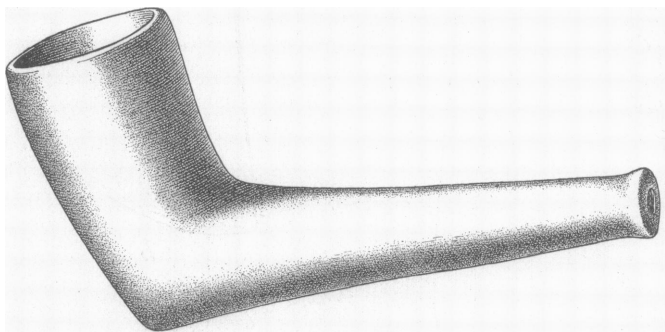


Fig. 13. Elbow Pipe.

blackened by use. Many believe that the elbow pipe was unknown in the Pueblo Area in prehistoric times, the presence of the form, wherever found, indicating contact with Europeans. This was not the case in the San Juan Area. There are several elbow pipes among the material from Pueblo Bonito, some of stone, some of pottery, and there are no grounds upon which could be based a contention that Pueblo Bonito has been inhabited since the coming of the Spaniards. The occurrence of elbow pipes at Bonito, Aztec, and at two other sites, one fifteen, the other thirty-five miles west of Aztec, where they have been observed by the present writer, proves that they were known and used over a considerable portion of the San Juan drainage in black-on-white time.

Hematite Implements and Ornaments. Hematite was not extensively used by the aborigines of the Aztec Region. The collection contains one double-faced hammer (Fig. 9b) and two single-bitted axes. The material of the hammer is soft and easily rubbed away; that of the axes is very hard, and susceptible of a high polish. The weight of the hammer is $13\frac{1}{2}$ ounces, of the smaller ax $11\frac{1}{2}$ ounces. The larger specimen is incomplete.

Cylinders of hematite are the most common artifacts from this material. There are four in the present collection, varying from $1\frac{13}{16}$ inches long and $\frac{3}{8}$ inch in diameter, to $1\frac{1}{8}$ inches in length and $\frac{3}{8}$ inch in diameter. Presumably, these objects were paint sticks (Fig. 14a).

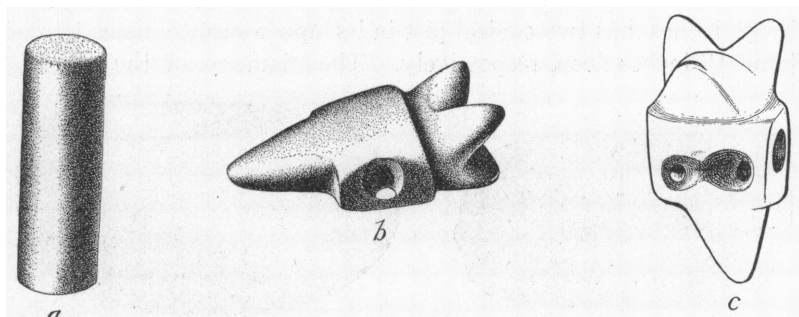


Fig. 14 a (29.0-7217), b-c (29.0-7216). Cylindrical Hematite Paint Stick and a Hematite Animal Effigy. From Grave 14, Room 52, East Wing.

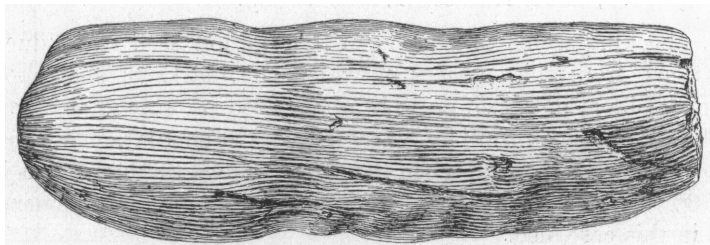


Fig. 15 (29.0-7923). Cylinder of Hematite Pigment moulded in Cornhusk. From Grave 16, Room 41, East Wing.

One hematite cylinder $1\frac{1}{16}$ inches in length has been perforated longitudinally, fitting it for use as a bead.

Fig. 14bc illustrates an animal effigy pendant or ornament $2\frac{7}{32}$ inches in length. The drilling and finish of this object exhibit remarkable skill.

The dust ground from hematite pebbles and from ornaments and implements in process of manufacture was saved and used for pigment. Fig. 15 illustrates a cylinder of this dust which had been moistened and

the pasty mass enclosed in a cornhusk wrapper, the impression of the texture of which is clearly visible upon the surface of the now hardened mass.

Pebbles of hematite are found now and then on the higher erosion remnants in the Aztec Region, and some thirty miles west there is an area of an acre or more thickly strewn with them.

Mortars. Sandstone of varying degrees of hardness is the material from which the six mortars found to date are made.

Two are made from blocks of the soft, light green stone from which most of the walls of the ruin were built; in fact these stones were originally intended for building purposes, to judge from their rough rectangular form, and the presence of a pecked face on the larger end. One, 6 by 8 by $3\frac{3}{4}$ inches, has two conical pits in its upper surface instead of one, $1\frac{1}{4}$ and $1\frac{1}{2}$ inches deep, respectively. The diameter of the pits is $2\frac{1}{2}$

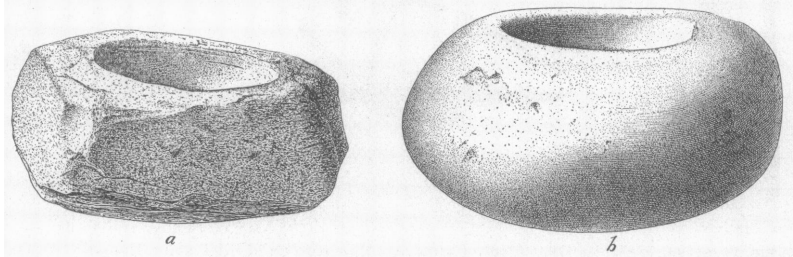


Fig. 16 *a* (29.0-7090), *b* (29.0-5198). Types of Mortars. *a*, made of building block, Room 45, East Wing; *b*, made of a river boulder, Room 6, South Wing.

inches. Pecking seems to have been the method used to produce the excavations, from the surfaces of which the marks of sharp-pointed implements have not been entirely obliterated by subsequent wear.

The second block is $6\frac{1}{2}$ by $5\frac{1}{4}$ by 3 inches (Fig. 16*a*). The bowl of this mortar is slightly oval when seen from above, its dimensions being $4\frac{1}{2}$ by $3\frac{3}{4}$ by $1\frac{1}{8}$ inches deep. Marks of a pecking implement are visible in this case also.

The third mortar is also of local sandstone. In form, it is roughly cylindrical, $4\frac{3}{4}$ inches in diameter and 3 inches high, all surfaces having been carelessly worked. The hemispherical bowl is $2\frac{1}{2}$ inches in diameter and $\frac{7}{8}$ of an inch deep. It was made by pecking, but shows no subsequent wear. A similar excavation has been begun on the opposite side of the stone.

Sandstone boulders from the river drift so plentiful in the stream bed, and along the breaks of the ancient terraces left by the river, were chosen as the materials for the other three mortars. One of mottled

red and white sandstone is nearly circular, 6 inches in diameter and $3\frac{1}{4}$ inches in height. The bowl is $3\frac{1}{2}$ inches in diameter and $1\frac{1}{8}$ inches deep, neatly executed and worn smooth. From the edge of the bowl, the rim slopes obliquely downward for about one inch, from which point the roughly dressed sides descend perpendicularly. The sloping rim has been ground smooth.

The second of the latter three is from a fine-grained, homogeneous pink sandstone either cemented with siliceous material or partially changed to quartzite. The somewhat irregular boulder was reduced to a more or less globular form by pecking away the protuberant corners. The stone is $7\frac{1}{2}$ inches in diameter and $4\frac{3}{4}$ inches in height, the bowl being $4\frac{1}{2}$ inches in diameter and $1\frac{1}{8}$ inches deep. Although worn quite smooth, the surfaces of the excavation show marks of a pecking tool.

The last of the series is made from an oval boulder of hard, fine-grained, light gray sandstone, flecked with red (Fig. 16b). Aside from the excavation, the surfaces of the stone are unworked, save by nature. The stone is 7 inches in diameter and 4 inches high. If made by pecking, continued use has removed all marks of the tool from the surfaces of the bowl. Its dimensions are $3\frac{3}{4}$ by $\frac{7}{8}$ inches.

Although objects that can be definitely identified as pestles have not been found, it is probable that grinding in the mortars was done with water-worn boulders of suitable form.

Metates. There are three recognizable types of metates. Relatively thin rectangular slabs of rather fine-grained greenish sandstone constitute the material of the first type. The nearest outcrop of such stone is several miles distant from the ruin.

Manos for this type of mill were invariably shorter than the width of the metate, so that in time the grinding surface was worn down, leaving wall-like elevations at each side. Assuming that the metates were set at an angle, the grinding surface extends to the lower end of the slab, but is not continued to within less than three or four inches of the upper end. Aside from the grinding surface, the slabs show no working except that incidental to blocking them out to the desired form.

Large river boulders were used for the second and third types of metates. Many stones of suitable form may be found in the drift. Mottled pink and white granite and siliceous sandstone were most commonly used. The stones chosen were more or less oval in outline as well as in cross-section, and one surface was flattened by pecking to afford a grinding surface of uniform contour.

A separation of river boulder metates into two types depends upon the relative length of mano used with each. Where the mano was as long or longer than the width of the nether stone, with continued wear all parts of the grinding surface of the latter were worn away at the same rate, so that even the worn-out metates have flat surfaces with no vallations at the sides.

Manos used with the third type of metate were shorter than the width of the metate. Due to the lack of wear at the sides, the metates in time came to be of trough shape, sometimes the trough having been worn to as much as 5 inches in depth.

No ornamented metates have been found in the vicinity of Aztec.

Manos. The same range of materials was used for manos as for metates; sandstone from the harder strata of exposures a few miles distant; and the more durable sandstones and granitic rocks brought from a distance by the river.

All stages are represented, from manos blocked out and pecked to the desired shape preparatory to use, to those that have been completely worn out.

One type of mano is rectangular, the examples at hand ranging from $4\frac{1}{2}$ by 11 inches to $5\frac{1}{2}$ by 14 inches. The maximum thickness, in an unused specimen, is $3\frac{3}{8}$ inches, the minimum, $\frac{7}{16}$ inches. These show wear only on one side. They were used upon flat metates, type 2 of the series outlined above.

The second type is represented in the present collection by a single specimen. It is $9\frac{1}{2}$ by $3\frac{1}{2}$ inches, very much worn (thickness $\frac{5}{8}$ inch) and slightly oval when viewed from above. The lower side is flat and the upper beveled from the longitudinal center in both directions. Consequently, the stone in cross-section would appear as an isosceles triangle. All three surfaces have been used in grinding. Wear at the ends on the lower side indicates that this particular specimen was used in a trough-like metate.

The third type of mano is roughly rectangular, with rounded corners. A representative specimen is $8\frac{1}{2}$ by $4\frac{1}{2}$ by $1\frac{1}{2}$ inches. Slight indentations of the opposite edges, about midway of the length of the stone, suggest intentional shaping to facilitate grasping with the hand. Only one side has been worn. When viewed laterally, the used face presents a gently curving arc, turning abruptly upward at both ends. This kind of mano was used in the deep trough-like metates—type 3 of the foregoing list.

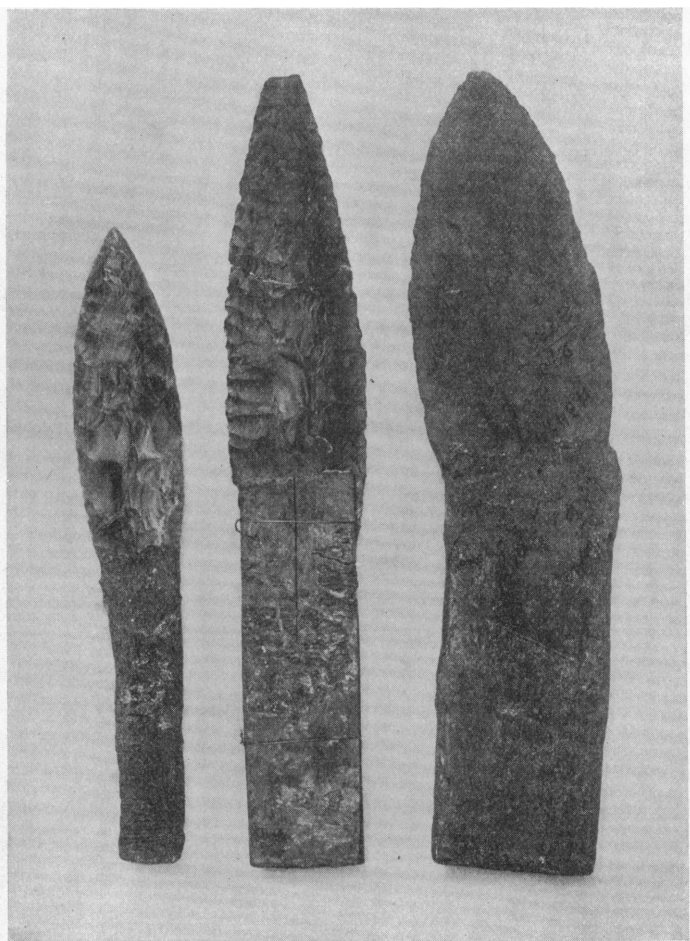


Fig. 17 (29.0-6740, 7408, 6739). Hafted Knives. *a-c*, from Grave 8, Room 27, East Wing; *b*, from Room 62^a, North Wing.

Chipped Implements. Large chipped blades, in common parlance, spear points, are relatively numerous in the great pueblo, twenty-nine having been found to date. For their manufacture various materials were chosen, quartzite, jasper, chalcedony, agate, and in one case, obsidian, giving a range of color from black to white. In outline, the

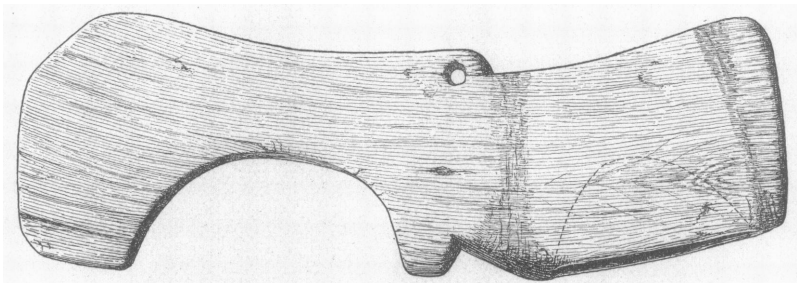


Fig. 18 (29.0-7302). Wooden Knife Handle of Unusual Form. From Room 49, East Wing.

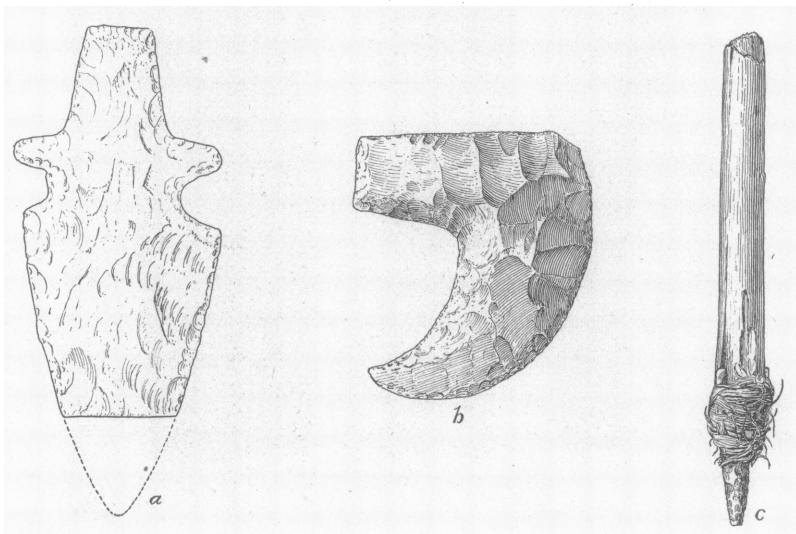


Fig. 19 *a* (29.0-6913), *b* (29.0-6914), *c* (29.0-7332). Two Types of Knife Blades and a Drill with Wooden Shaft. *a*, notched for hafting, Room 40, East Wing; *b*, sickle-shaped, Room 40, East Wing; *c*, from Room 54, East Wing.

blades are leaf-shaped, some relatively broad, some very narrow in proportion to the length. The complete specimens vary in size from length $1\frac{1}{4}$ inches; breadth, $\frac{7}{8}$ inches; thickness, $\frac{3}{16}$ inches; to length, $6\frac{1}{2}$ inches; breadth, $1\frac{1}{16}$ inches; thickness, $\frac{1}{4}$ inch.

In Fig. 17 are shown three chipped knives which retain their original wooden handles. Two of the handles are solid, that is, made from one piece of wood, while two flat pieces have been joined to form the third handle. To construct a solid handle, a piece of wood was dressed to the desired form. Then a slot, roughly the shape of the extremity of the blade for which the haft was intended, was gouged out of one end of the block. In order to make the blade secure in the slot, the latter was partially filled with gum, then the blade was pressed into the slot as far as it would go. This forced the gum backward along the blade so that it completely filled the space between wood and stone; after the gum hardened, blade and haft were held rigidly together. String or sinew was wrapped spirally about the handle and down a short distance on to the blade, in order to increase the strength and rigidity of the implement (Fig. 17a, c).

The two-piece handle was fashioned from two sections of wood, rectangular in outline, and slightly curving when viewed in cross-section. These were placed hollow side to hollow side, one end of the blade was inserted between them, and the various parts were firmly cemented together with gum. An exterior wrapping of cord or sinew covered the handle and extended a short distance upon the blade (Fig. 17b).

To judge from the specimens retaining their hafts, and from the pitch marks upon several detached blades, the blades were usually set at a slight angle to the haft as shown in Fig. 17c.

An unusual type of knife handle is illustrated in Fig. 18. It consists of a single piece of wood, with the slot for the insertion of the blade in one edge instead of in the end. A blade with lateral notches similar to the one appearing in Fig. 19a must have been fitted to this haft. At least, the diagonal marks of lashing crossing the wood on both sides of the slot strongly suggest an attachment of the blade by passing the lashing through notches on the sides.

The sickle-shaped blade shown in Fig. 19b is unique among specimens from the Southwest. Securely hafted, it would have been a pleasingly effective implement or weapon.

No evidence is at hand to suggest that spears or lances were used by the Pueblo of the Aztec Region, and until proof to the contrary is forthcoming, the large blades commonly thought to be spear points must be regarded without exception as knife blades.

Arrow points from the great pueblo and vicinity fall into four types when arranged according to shape (Fig. 20a-d). Of these the square-

shouldered type (Fig. 20b) is the most characteristic, being represented by 275 of 300 points. Wherever arrow points have been found in numbers—in graves, caches, etc.—they have been without exception of the square-shouldered type, indicating that this sort of point was manufactured almost exclusively during the later phases of Pueblo occupation at Aztec.

The arrow points impress one as being on the average very small, the minimum and maximum lengths being respectively $\frac{3}{16}$ of an inch and $1\frac{1}{16}$ inches. Some specimens are crude, but the chipping on the whole is skillfully done.

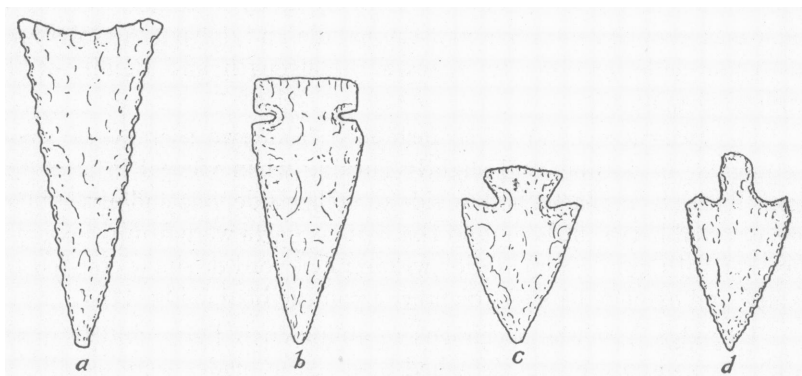


Fig. 20 *a* (29.0-6942), *b* (29.0-5188), *c* (29.0-6817), *d* (29.0-5415). Four Types of Arrow Points. *a*, from Room 46, East Wing; *b*, from Room 2, South Wing; *c*, from Room 42, East Wing; *d*, from the Court.

A great diversity of material was used in the manufacture of arrow points, any stone with a conchoid fracture having been regarded as a suitable raw material. Quartzite, jasper, chalcedony, various agates, and obsidian may be distinguished without microscopic examination. Pebbles of all of these substances except obsidian may be found among the river drift, whence the Indians obtained their supply.

Obsidian is not known to occur nearer than 125 miles to the eastward, which fact doubtless is responsible for the relative scarcity of obsidian artifacts.

Light gray, fine-grained quartzite was used more frequently than any other material. It is plentiful among the gravel, and is very easily chipped. As many as two hundred quartzite points have been found in one cache.

The collection of chipped artifacts contains three drills. One with part of its original shaft is shown in Fig. 19c. A tapering point with wing-

like extensions on either side of the extremity opposite the point is the characteristic form of the stone portion of a drill. The mounting of the figured specimen consists of a split stick, between the halves of which the flat end of the drill was inserted and bound in place with yucca fiber.

BONE IMPLEMENTS

Methods of Cutting Bone. In splitting a long bone the initial step consisted of making a scratch along both the anterior and posterior surfaces of the bone, almost the entire length of the shaft (Fig. 21a).

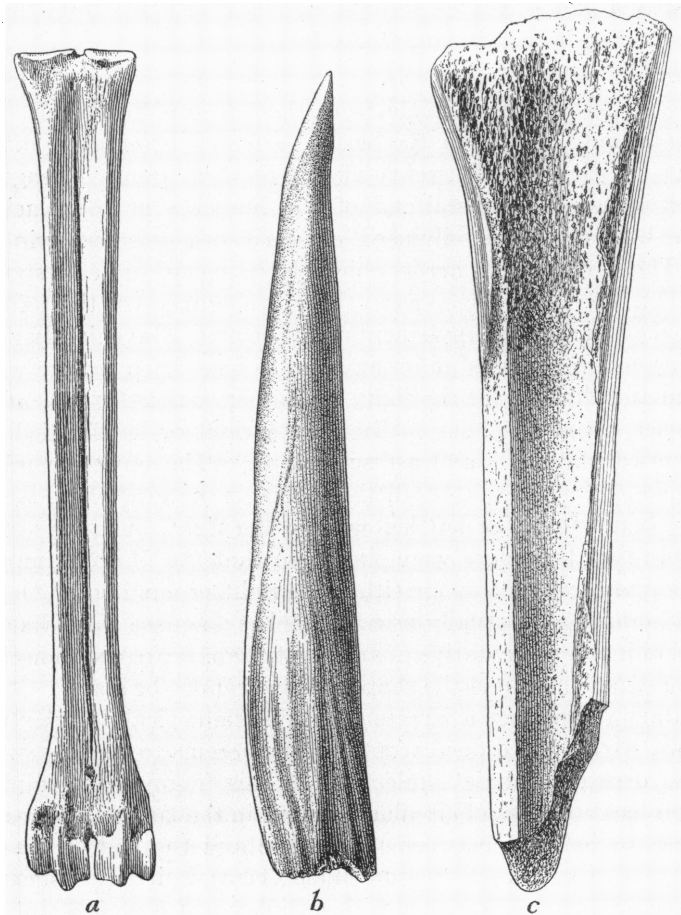


Fig. 21 *a* (29.0-5182), *b* (29.0-7027), *c* (29.0-5781). *Methods of Working Bone and a Pointed Implement of Horn.* *a*, bone grooved for splitting, Room 2, South Wing; *b*, from Room 47, East Wing; *c*, section of split bone, Room 2, South Wing.

By continued scratching with chips of flint, or similar spalls, V-shaped grooves were worn nearly, if not quite through, the hard shell of the bone. A sudden blow, or wedge-like pressure, was then sufficient to split the longitudinal sections apart (Fig. 21c). The same procedure was followed in making a transverse section. A groove was cut around the shaft at the desired point, and was deepened until the workman could break the bone, the fracture naturally following the groove (Fig. 22d).

Horn was split and cut by the same method. However, in removing the prongs of deer horns, the spikes were broken off from the main horn, cutting being resorted to only in removing horns from the skulls or in sectioning horns too large to be broken easily.

Scrapers or Fleshing Tools. The collection contains thirty-four scrapers or fleshing tools made from the bones of mammals. These scrapers fall into two types, the basis of separation being the difference in size. The larger ones, twenty-nine in number, range in length from $3\frac{3}{4}$ to $6\frac{1}{4}$ inches. The distal end of the humerus of the black-tailed deer, the bone most generally used, gives a very convenient grip for the hand. The shaft was cut across obliquely so that it formed a spoon-like blade (Fig. 23e). In some cases, the protuberances of the joint were smoothed off so that the implement might be more conveniently grasped. Of twenty-seven scrapers, fourteen seem to have been for use with the left hand and thirteen for the right. Whether or not this indicates conscious selection of the bone utilized for a right or left-handed tool is problematical, but it is at least suggestive. The objection might be made that in a utilization of all the available material there would be as many bones from the left leg as from the right, but it is not at all impossible that the bones were chosen so that the finished implement would be more convenient for either the right or left hand. One fragmentary scraper of unusually heavy bone has a square chisel-like point. Whether this is representative of another type or is merely an accidental variation depending upon the shape of bone cannot be stated. Another fragmentary scraper has a serrate edge like the typical fleshing tools of the Plains Area. With one exception, there seems to have been no attempt to ornament these implements. This fragmentary implement (Fig. 24c) has two rows of circular incisions in the convex surface of the bone perhaps halfway between the handle and the end of the blade. Each of these circular incisions surrounds a central pit. It is presumable that these depressions were set with an inlay of turquoise, since ornamentation of this sort has been found upon a few scrapers from Pueblo Bonito.

The smaller scrapers average $1\frac{1}{8}$ inches in length. They are made from the proximal phalanges of deer (Fig. 22b), but the shape and treatment is as nearly identical with that of the large scrapers as the contour of the bones would permit.

These implements are called scrapers or fleshing tools not because there is any objective information that proves that they were so used, but because they are similar to the fleshing tools of other areas and

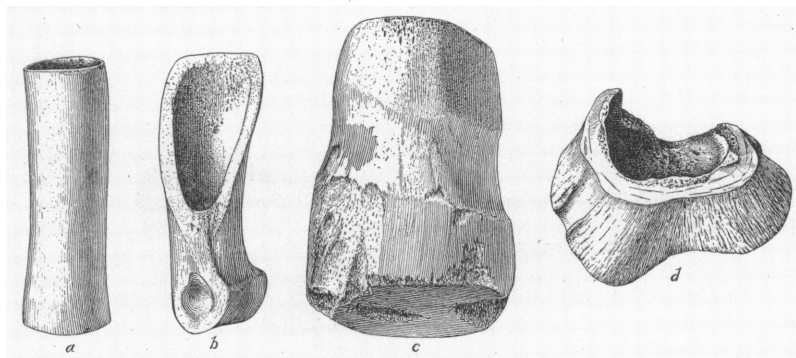


Fig. 22 *a* (29.0-7499), *b* (29.0-7546), *c* (29.0-7026), *d* (29.0-5248). Implements and Methods of Working Bone and Horn. *a*, bird bone tube, lower level, Room 65, North Wing; *b*, bone scraper, Room 48, East Wing; *c*, elkhorn hammer, Room 47, East Wing; *d*, bone showing method of making a transverse section, Room X, East Wing.

because this is the most probable use that can be assigned to them. The larger ones may very well have been used in digging also, for held in the hand, they would make a convenient gouge or pick with which to bring down the banks of an excavation.

Scraper of Deer Jaw. In one instance, the left side of the lower jaw of a deer was used as a scraping tool. This implement appears to have been used like a draw knife. The sharp lower edge of the bone has been highly polished and worn through at the center by long continued use.

Bone Paddles or Spatulas. There are three paddle-like implements from 5 to $6\frac{1}{4}$ inches in length, made from ribs. They have curved blades at one end, the result of rubbing. The opposite end has not been worked.

One object of similar form is made from a portion of the shaft of a heavy bone, worked upon all surfaces. There is one implement more paddle-like than all the rest, $6\frac{1}{2}$ inches in length and $2\frac{3}{16}$ inches in width at the broadest point. It is made from the flat portion of a shoulder blade. All surfaces have been rubbed smooth. This implement may well have been a pottery smoother.

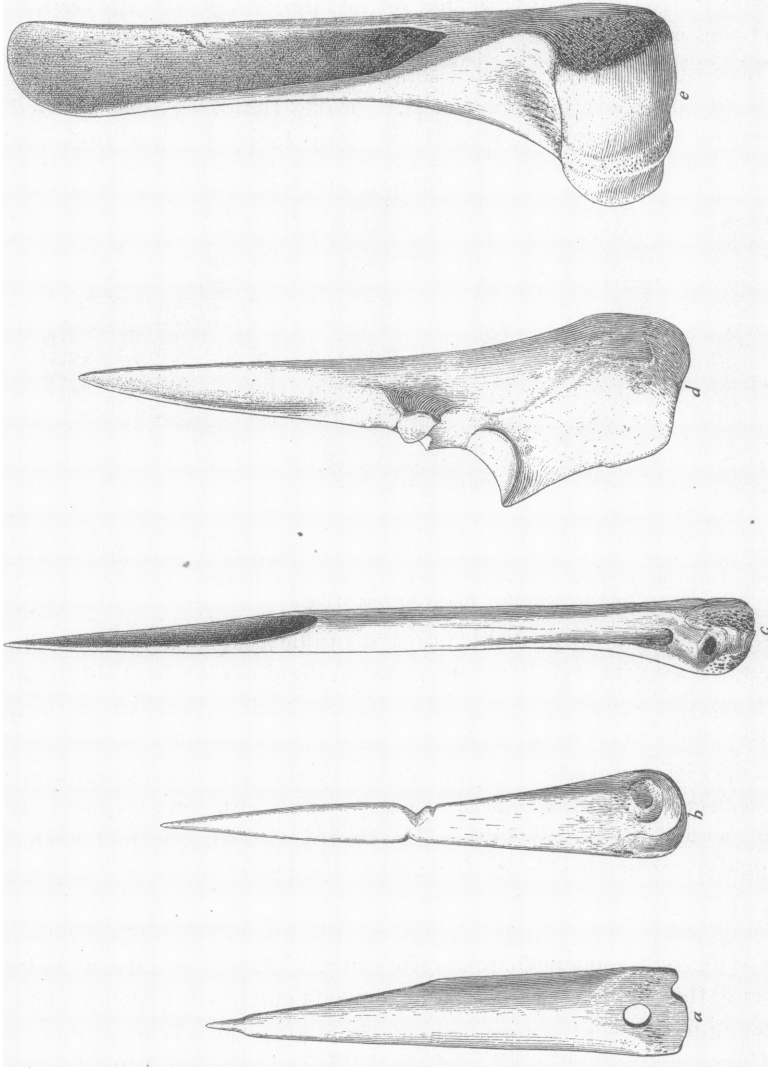


Fig. 23 *a* (29.0-7033), *b* (29.0-7103), *c* (29.0-7065), *d* (29.0-7035), *e* (29.0-7152). Types of Awls and a Bone Scraper. *a*, perforated mammal bone, Room 47, East Wing; *b*, notched mammal bone, Room 50, East Wing; *c*, bird bone, Room 47, East Wing; *d*, olecranon type, Room 47, East Wing; *e*, from Room 48, East Wing.

Pointed Implements. In regard to pointed implements, the first thing to impress one is the great diversity of shape and size. Both animal and bird bones were utilized in the manufacture of this type of implement. There are 232 of mammal bone and fifty-two of bird bone. The generalized function of perforating tools may be assigned to these implements. Doubtless, they were much used in the manufacture of baskets, as well as to pierce hide or tough fabrics, preparatory to sewing with yucca needles. The long, keen ones would have been effective weapons at close quarters, and some may have served as stilettos.

The four needle-like implements range in length from $1\frac{1}{2}$ to $4\frac{3}{4}$ inches. They are wide and flat, considering which it is doubtful if they could have been strung with cord to serve as needles except for use in extremely coarse fabrics. The eyes are situated near the blunt end opposite the point (Fig. 23a). The eyes are circular and show no grooves at the back side such as would have resulted from the continued wear of thread if they had been used for sewing. It may be that these perforations were for the purpose of suspending the implements and were not intended to intensify the needle-like function.

There are eleven awls made from the olecranon process of the ulna of deer (Fig. 23d), ranging in length from $3\frac{3}{4}$ to $6\frac{1}{2}$ inches. This implement is so well represented in the archaeological collections from practically all parts of the world that it seems unnecessary at this point to give further description.

Some of the awls retain the articular surface at the handle end without changes or modifications. Whether this enlargement was left to give a better grasp for the hand, to strengthen the implement, or because of its ornamental effect, we do not know. There are four of this type, ranging in length from $2\frac{7}{8}$ to $8\frac{1}{4}$ inches. The longer ones are keen and stiletto-like and some of the short ones very blunt and stubby. The sides of three awls of medium length are deeply notched as if by drawing a cord between the implement and the thumb or finger (Fig. 23b). This suggests that they may have been used in straightening cords or thongs. The high polish of the groove indicates that they were not made with intention, but resulted from the long use of the implement for a special purpose.

The next series consists of fifty-seven implements ranging in length from $3\frac{3}{8}$ to 9 inches. In the main, these are slender, rather keenly pointed, and all surfaces of the bone, both the tips, sides, and blunt ends, have been rubbed smooth. In general, they would be oval or circular in cross-section.

There are four implements varying from $2\frac{1}{2}$ to $4\frac{1}{8}$ inches in length which seem to constitute a distinct type. They taper gently from very sharp points to within about half an inch of the blunt end and then flare rather abruptly outward to form a flat, square-ended handle.

There are four awls made from lateral metapodia of deer. These vestigial bones in their natural condition need but very little pointing to transform them into well-shaped implements and it seems strange that more of them were not utilized.

There are nine remarkably slender implements, almost circular in cross-section, which resemble the stiletto used in modern embroidery. The length varies from $2\frac{1}{8}$ to 5 inches.

One flat, square-ended awl has five serrations worn in the basal end as if by threads.

There are two short blunt implements about which rough grooves have been scratched near the thicker end, possibly for the attachment of thread.

There is a series of eight awls varying in length from $2\frac{1}{2}$ to 4 inches, roughly rectangular in cross-section, with a generalized outline comparable to an extremely slender arrow point without the notch. It is apparent that the wider end was shaped for some special function.

There are nineteen stubby, although sharp-pointed awls from $1\frac{1}{4}$ to $3\frac{1}{4}$ inches in length, which seem to constitute a type. In most instances, the entire surface has been worked, indicating that the form is intentional rather than due to the accidental shape of the bone utilized.

There are six rather small awls made from the leg bones of rabbits, rather carelessly pointed and generally rough and crude.

While generally only the heavier bones, particularly those of the leg, were used for making implements, occasionally other portions of the skeleton were utilized. There are two awls made from ribs; one from part of the jaw of a deer, and two others that are presumably portions of shoulder blades.

There is a series of twelve awls, varying in length from $3\frac{3}{8}$ to 5 inches, which although flat, are broad and heavy, but show more or less workmanship on all edges as if the general blunt form were intentional.

The remainder of the awls of mammal bones—some seventy-seven in number—are rough fragments or splinters from the shafts of bones which have been pointed but not otherwise worked. There may be included in this number a few incomplete ones which, had they been entire, would have ranked among the finer implements.

Of the fifty-two bird bone awls, twenty are made from the bone of the second joint of the leg. The distal end was left for a handle and the shaft of the bone was cut across diagonally and the point rubbed smooth and sharp (Fig. 23c). The range in length is from $2\frac{3}{4}$ to $7\frac{1}{2}$ inches.

There are four awls made from the lower leg bones, the cleft joint at the beginning of the foot being left to afford a grasp for the hand.

The other bird bone awls were made from splinters of bone, most of them rough and unworked except upon the point. Most, if not all of them, are bones of the turkey.

Bird Bone Tubes. The most numerous of bone artifacts are tubes with both ends carefully worked. The majority of them are made from the smaller bone in the second joint of the wing. They vary in length

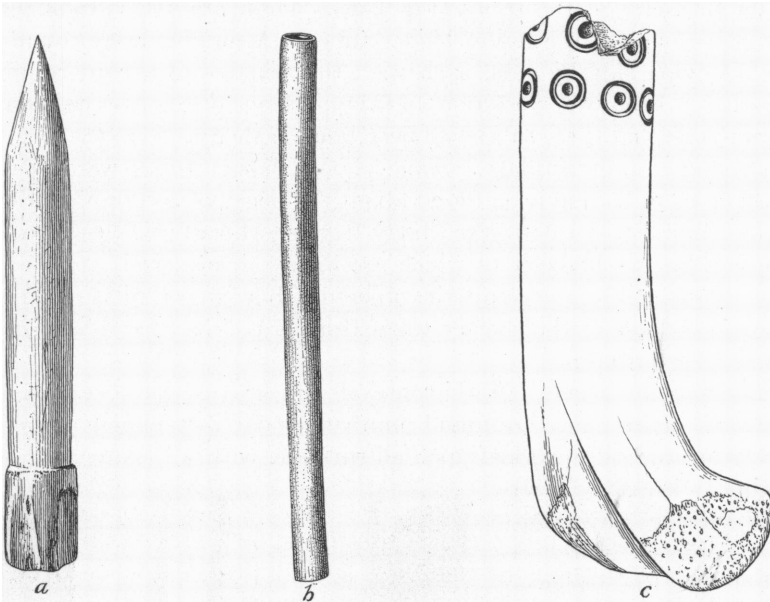


Fig. 24 a (29.0-5176), b (29.0-7846), c (29.0-7158). Types of Bone Implements. a, bone point of unknown function, Room 2, South Wing; b, bird bone tube, Room 55, East Wing; c, fragmentary bone scraper prepared for the reception of inlay, Room 51, East Wing.

from $1\frac{1}{8}$ to 7 inches (Fig. 24b). It is rather difficult to account for the presence of so many of these objects; 405 were found with the skeletons of fifteen children. It is highly probable that some of them were used as turkey calls. Those who have hunted the wild turkey are able with these tubes skillfully to imitate the call of the bird. But it would be impossible to account for the large numbers of them by assuming that this was their

only function. It has been suggested that they were counters for games, drinking tubes, or that possibly they were strung together to form an ornamental or protective breastplate. However, when buried with the dead, they seem to be grouped into small bundles of from six to thirty. From their position in the soil it would seem that they were tied in bundles; in one case there appeared to be the remains of cloth or skin, colored red, which had been bound about them. The assigning of a definite function must remain until some further light is thrown upon the subject.

There is another series of bird bone tubes ranging in length from $\frac{1}{4}$ to $\frac{3}{4}$ inches. These also are carefully cut, smoothed, and polished, the main point of difference from the preceding group being the much greater diameter of the tubes (Fig. 22a). These are not so frequently encountered as are the more slender tubes. A number were found in Kiva D, lying side by side, each with the remains of a cord running through it. From their position and the presence of the decayed string it is probable that these tubes had been bound side by side in the form of an ornament or breastplate. Some of the shorter tubes were beads, strings of them having been found about the necks of certain skeletons. On the left wrist of a desiccated body from southwestern New Mexico, there is a leather bracelet to which are bound, transversely, two bone tubes. Presumably, the composite object is a bow guard, rather than an ornament. Some of the shorter tubes from Aztec may have been used for a similar purpose.

Backing for Beads. With some of the graves and occasionally among the débris there are found numbers of flat rectangular pieces of bone rather carefully worked upon all surfaces, with a V-shaped groove running longitudinally across one face (Fig. 25b). These objects were cemented to the backs of beads made from materials that were not sufficiently strong to be durable in thin sections, such as abalone shell and portions of galena crystals.

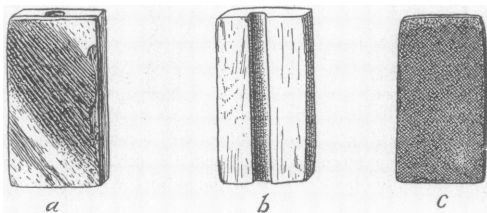


Fig. 25 a (29.0-7976a), b (29.0-7976b), c (29.0-7976c). Composite Bead of Abalone Shell and Backing. a, entire bead; b, grooved bone backing; c, reverse side of shell covering. From Grave 16, Room 41, East Wing.

There are several objects of bone which do not lend themselves readily to classification. One is a section of a heavy bone, $2\frac{3}{4}$ inches long, oval in cross-section, with what apparently were square-cut ends.

Another is $4\frac{1}{4}$ inches in length, rather flat in cross-section, with rounded points. There are two rabbit bones, both ends cut and very well smoothed, with nothing to indicate what their use may have been, or what their eventual form would have been if it is assumed that the work upon them was not complete. One object made from a very heavy compact piece of bone seems to be unique (Fig. 24a). It is $3\frac{3}{4}$ inches in length with a maximum diameter of $\frac{7}{16}$ of an inch. Of the central portion $2\frac{1}{2}$ inches consist of a cylindrical shaft; at one end there is a tripartate base slightly larger than the cylinder in maximum diameter, suggesting in shape the feathered portion of the shaft of an arrow. The opposite end is keenly, though abruptly pointed. The presence of the point suggests a perforating tool, but no specific function is assigned to this object.

Articles of Horn. Although the presence of a good many deer horns in the refuse piles indicates that there was no scarcity of this material, it does not seem to have been used for implements to any considerable extent. One section has been rubbed smooth and deeply grooved on opposite sides as if for splitting, perhaps to make the haft of a knife or for some similar purpose. The only type of tool of more or less definite form consists of from $2\frac{3}{4}$ to 9 inches of the tips of horns, the points of which have been rubbed down to two converging sides to form a flat-pointed implement (Fig. 21b). The larger of these artifacts would have been convenient for digging in the earth or for gouging wherever this procedure was necessary.

What appears to be a hammer made of horn is $4\frac{1}{4}$ inches in height and $2\frac{3}{4}$ inches across the broadest face (Fig. 22c). It is cut square at both ends and is encircled by a diagonal groove. It is presumably the basal portion of an elkhorn, still in the velvet, or at least taken before the horn was mature. The faces are oval in cross-section, one partly at right angles to the other. In the center of the larger face there is a conical depression roughly $\frac{1}{4}$ inch deep.

WOOD AND WOODEN ARTIFACTS.

Methods of Working Wood. Invariably large trees were felled with stone axes. One would suppose that a tree 12 inches in diameter could have been burned down more easily than it could have been bruised in two with brittle implements whose bits at best were blunt and stubby. But if fire was used, thus far no beams severed by this agency have been found.

The ends of beams which have not been secondarily dressed are bluntly conical, coming almost to a point at the center, and look very much as if they had been gnawed off by beavers. Most of the timbers used in ceiling construction appear to have been cut in the spring when the sap was running. Every vestige of bark has been carefully removed, and the knots rubbed smooth, so that the heavy pine stringers and

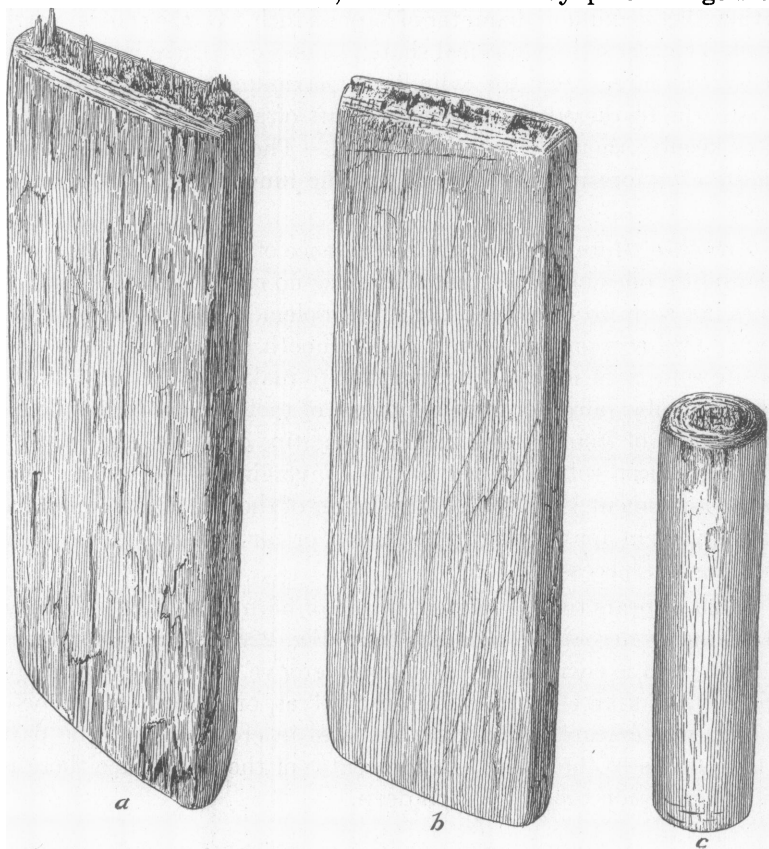


Fig. 26 *a* (29.0-7794), *b* (29.0-7795), *c* (29.0-7789). Slabs and Cylinder of Wood. *a*, shows method of sectioning, Room 48, East Wing; *b* shows slab cut and partially smoothed, Room 48, East Wing; *c*, shows method of sectioning, Room 48, East Wing.

smaller transverse beams of pine and cottonwood resemble lathe-turned cylinders more than peeled logs.

Exposed ends of ceiling timbers are cut off squarely at right angles to the axes of the beams, and are as smooth as if the cutting had been done with a coarse saw. After a log had been severed with stone axes, the conical end probably was removed as follows: With flint knives or

keen-edged chips of stone, a transverse groove was scratched progressively deeper and slivers were split from the sides of the cone back to the groove. This removal of the wood from one side of the groove prevented the scratching tool from binding in the slot, and also gave the carpenter room to work.

The immediate support of the adobe floors of all rooms above the first story, and of the roofs as well, consisted of a thatching of long strips of split cedar applied over the ceiling beams. Such quantities of split strips indicate that the mechanical principle of the wedge was known and used. No wedges of bone or antler have been found, but such splintery wood as cedar could have been split with relative ease by means of wooden wedges driven with clubs or stone mauls.

Small pieces of timber were cut in much the same way as bone. When it was desired to section a flat board-like slab, grooves were scratched across both faces and the edges as well. Subsequently the grooves were deepened sufficiently to enable the remaining portion to be broken without splitting in either direction from the groove (Fig. 26a). The ends were smoothed by rubbing with stones or similar abrading implements (Fig. 26b). Cylindrical pieces were sectioned by girdling them with a continuous groove deep enough to allow them to be broken apart (Fig. 26c).

Rubbing and polishing were resorted to when it was desired to impart a particularly smooth surface to a wooden object. The result is well illustrated by the sides and edges of the slab shown in Fig. 26b.

Wooden Artifacts. The wooden artifacts are in general rather non-descript and with two exceptions will be given in the following list without detailed description.

1. Peeled sticks, chico, willow, and cottonwood.
2. Peeled stick. Ends square cut and smoothed.
3. One side of stick split through middle, ends charred.
4. One half of stick split through middle. Painted red. Two perforations.
5. Curved stick. Short, thick, ends square cut.
6. Curved sticks, ends rounded, smoothed, decorated with spiral incised line.
7. Curved stick, hank of yucca string wrapped around one end.
8. Sticks, twig bound along each, looped slightly between bindings. End sticks of loom?
9. Short thick cylinders of wood.
10. Short thick cylinder of wood, perforated lengthwise. One end painted green with central disk of red.
11. Rectangular slabs of wood.
12. Short sections of split willow, ends smoothed, flat side painted red.
13. Flattened section of stick; perforated.

14. Thin rectangular slab, perforated at one corner and at mid point of one side.
15. Scraper-like chip. One end charred.
16. Blade of digging-stick.
17. Ends of pointed stick.
18. Needle or bodkin.
19. Worked stick, knob on one end.
20. Small ring, three-quarters of circle, ends smoothed.
21. Wooden loop, ends bound with yucca cord.
22. Wooden hoop.
23. Charred cylinder, hemispherical bowl hollowed out of one end.
24. Ends of decayed *pahos* or prayer sticks, points flattened like heads of snakes.
25. Small disk, perforated and strung on yucca cord.
26. Fire-making implements. The collection does not contain a complete set of fire-making implements. The only specimens are two fragmentary hearths, each of soft punk-like wood, presumably from the roots of cottonwoods. The large hearth is 1 inch in width, $\frac{5}{8}$ inch in thickness, $1\frac{1}{8}$ inches in length. Three pits resulting from the wear of the drill point, are all nearer one side of the hearth than the other. To judge from the size of the pits, the drill in this case must have been about $\frac{3}{8}$ inch in diameter. The second hearth measures $1\frac{1}{2}$ inches in width, $\frac{3}{8}$ inch in thickness, and $1\frac{3}{4}$ inches in length. The pits are $\frac{7}{16}$ inch in diameter, and in consequence cross almost the entire surface of the hearth. The slots from which the ignited dust ran from the three pits on to the tinder are all on the same edge of the hearth.
27. Flower-like ceremonial object. The collection contains one representative of a type of ceremonial object which was widely distributed over the northern Pueblo Area. This specimen in superficial appearance resembles a flower (Fig. 27), length, 4 inches. The stem is made up of three splints of wood wrapped spirally with a strip of grass or cane stem. Two flattened coils of wood strips, one passed at right angles through the vertical middle line of the other compose the flower head, which when seen from above resembles a cross with all four arms of equal length. A strip of bark passed over the axis of the cross, with its ends lashed to the stem by the wrapping of the latter, holds the flower head in place. Identical objects are present in archaeological material from Grand Gulch, Utah. They are known to the Navajo, who call them "Owl charms."

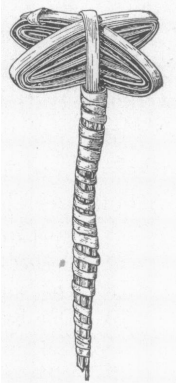


Fig. 27 (29.0-7746). Flower-like Ceremonial Object. From Room 48, East Wing.

Painted Bark. The few specimens of painted bark appear to be parts of a band $2\frac{1}{4}$ inches wide and of undetermined length, at least more than 10 inches. The bark is $\frac{3}{32}$ inch thick, and is part of a strip

peeled lengthwise either from an alder or a young cottonwood. The inner surface is divided into three longitudinal zones, the central one, about $\frac{1}{2}$ inch wide plain, the outer two decorated in colors. A narrow black line in the form of a serpentine curve traverses each colored zone from end to end, and the alternate indentations are painted, one green, the next reddish brown.

TEXTILES AND OBJECTS OF VEGETABLE AND ANIMAL FIBER.

Cotton Cord. The relative scarcity of cotton as a raw material for textiles may be indicated by the statement that of more than a thousand pieces of cord, only about twenty are of cotton, the rest being of yucca fiber. Several kinds of cotton cord may be distinguished as shown by the following table:—

1. Twisted cord.
 - a. Single-stranded, fine like thread.
 - b. Two-stranded.
 - c. Three-stranded.
 - d. Four-stranded.
2. Braided cord.
 - a. Square braided—twelve two-stranded cords, $\frac{1}{4}$ inch in each dimension.
 - b. Square braided—sixteen two-stranded cords, $\frac{1}{4}$ inch in each dimension.

Yucca Cord. Yucca cord is of both hard and soft twist, with the former in predominance. The cord ranges from the size of our coarse linen thread to $\frac{1}{2}$ inch in diameter. The varieties may be listed as were those of cotton cord:—

1. Twisted cord.
 - a. Single-stranded, fine thread-like.
 - b. Two-stranded.
 - c. Three-stranded.
 - d. Four-stranded.

One heavy cord ($\frac{3}{8}$ inch in diameter) consists of two smaller cords, each in turn made up of three two-ply strands, making a total of twelve strands for this small rope.

2. Braided cord.
 - a. Three-stranded only, both coarse and fine.

Grass Rope. One specimen, flat braided, three-stranded, $\frac{1}{8}$ inch in diameter.

Feather Cloth. Numerous individual strands taken from refuse heaps indicate that feather cloth was known and used by the inhabitants of the Aztec Ruin.

Yucca cord was the real base or body of feather cloth. To prepare the feathers for use, each one was split and all of the quill trimmed away except the narrow strips to which the barbules were attached. These strips with down attached were then wound spirally around fairly coarse cords, and inclined so that the successive layers of down overlapped each other shingle-like, completely hiding the yucca cords and the quill portions of the feathers. The resulting appearance of the cords was that of fluffy strands of down, almost as large as one's little finger. Such cords were used as both warp and woof of loosely woven blankets and jackets.

Cord Wrapped with Gut or Hide. An appreciable proportion of yucca cords was wrapped spirally, some with what appear to be strips of gut, others with strips of rabbitskin.

It is not known for what purpose the gut-wrapped cords were intended. It is hardly to be supposed that such stiff rough cords would have been considered suitable either for warp or woof of cloth which was to be worn or made into garments. Whatever their function, the gut wrapping would have materially increased the strength and durability of the cords.

That the cords wrapped with rabbit hair were woven into garments similar to those made of feather cloth seems the most plausible suggestion, but thus far there is no objective evidence to confirm this statement.

Cotton Cloth. The collection contains about forty specimens of cotton cloth, some decayed, some charred, others perfectly preserved, but no complete garments, bags, or other manufactured articles.

At least three different weaves may be distinguished, but the variations of technique of which they were the result cannot be discussed in detail at this time.

The most flimsy cloth consists of threads which although loosely woven average thirty-seven to the inch. Strands of both warp and woof are of the same diameter, and though loosely woven, are evenly spaced throughout, imparting a uniform texture to the resulting fabric.

Perhaps the highest tribute to the skill of the weavers is a cloth comparable in texture and flexibility to ten ounce ducking. Its individual threads are of relatively large diameter, averaging twenty-seven to the inch. So tight and close is the weaving that after moisture had expanded the fibers, the cloth would turn water as well as an ordinary light weight tent cloth.

A very heavy, rather coarse cloth resembles in appearance a knitted fabric. Each of its threads consists of two cords about the size of a common white package twine, twisted together. The method of their manipulation imparted to the cloth an open meshwork effect, there being only six strands to the inch. In this case, yucca fiber was mixed with the cotton.

Of twenty-nine well-preserved samples of cloth, four are decorated with simple patterns of dark red.

Twilled Plaited Sandals. Plaited sandals, without exception, are twilled, and invariably the plaiting was begun at the toe end. The material chosen for the manufacture of plaited sandals consisted of strips of yucca leaves used while still fresh and pliable. In width the strips vary from $\frac{3}{32}$ inch to $\frac{3}{16}$ inch. However, both narrow and wide strips were never used in the same sandal, the texture of each specimen being fairly uniform throughout. Owing to the natural toughness of the yucca, and the tightness of the plaiting, these articles of footgear were of considerable protective value, and were fairly durable. When finally worn through at the heel, or under the ball of the foot, occasionally they were patched with the same material of which they were made.

All thirteen of the entire plaited sandals have an offset or shoulder on the outer side, just in front of the spot normally occupied by the little toe (Fig. 28). Some sandals are flat, others intentionally cupped at the heel. Some plaited sandals are much wider in proportion to the length than others, width $3\frac{1}{4}$ inches, length $10\frac{1}{2}$ inches; and width $4\frac{1}{4}$ inches, length $9\frac{1}{4}$ inches, being the extremes of the present series.

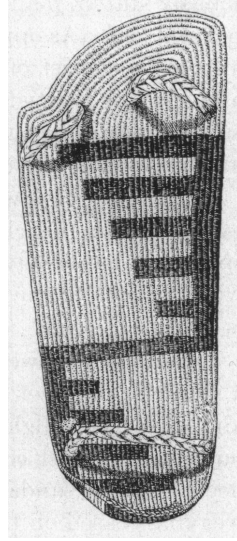


Fig. 28 (29.0-7634). Cloth Sandal. From Room 48, East Wing.

Plaited sandals were attached to the foot in either of two ways, each subject to slight variation. The majority of specimens have two transverse loops near the forward end and one larger one crossing the sandal at the rear. When putting on one of these sandals, the wearer inserted certain toes in the forward loops, pulled the rear loop up over the protuberant portion of the heel, and then to keep the heel loop in place, tied a cord from one side of it around the ankle to the other.

In other cases a continuous series of loops is attached to the edge of the sandal. Cords run through these loops formed a net-like arrangement, which, after the foot had been inserted, was drawn tight and its ends tied to the heel cord at the sides. Two specimens have a lining of husks inside of the meshwork, which protected the foot much after the fashion of the upper of a shoe. Toe cords and lashings of this type of sandal are invariably of yucca fiber.

Plaited sandals were not decorated in colors, and in no observed instance was a variation of plaiting technique introduced to produce an ornamentation inherent in the fabric.

Twined Cloth Sandals. Although both cloth and plaited sandals were made from materials afforded by the yucca plant, except in shape, these two types of footgear bear no resemblance to each other. As previously stated, plaited sandals were constructed from crude strips of the natural leaf. As opposed to this both warp and woof of the cloth sandals appear to consist of yucca fiber macerated from the leaf, freed of pulp, and spun or twisted into cords. This mere elaboration of material consumed more time than would have sufficed to complete a plaited sandal, and in addition demanded from the artisan a higher quality of skill.

No other known textiles from the Aztec Region can compare in excellence to the cloth sandals, all of which are twined. The finest specimen has twelve four-ply warp threads and fifty-seven two-ply woof threads to the inch. So close is the weaving that when the sandal is held to the light, not a single ray leaks through.

Each of the twenty complete specimens in the present collection has a shoulder or offset on the outer side where the curve of the toe begins and each has a slightly cupped or upturned heel. The following briefly outlines the most common method of imparting a cupped effect to the heels of these sandals. When the sole had reached the desired length, weaving ceased on the outer five to seven warp strands of each side, but was continued on the central strands for a distance equal to the width of the strip which had been dropped on either side. Then this extending flap and the sides of the sole were bent upwards until the ends of the strips where the weaving had been discontinued met the edges of the flap. Along the lines of contact, the ends of the warp strands of the side strips were used to sew together what had now become sides and end of the cupped heel. The ends of the warp strands of the flap or heel piece were subsequently twined into a tough border which crossed the heel piece and was attached to the corners of the side pieces, thus adding both strength and ornamentation to the sandal. In a minority of speci-

mens, however, the heel piece was not produced by weaving upon the warp strands as described above, but the warp strands themselves were plaited together to form the rear portion of the heel, and the warp strands of the sides of the heel were tied through the edges of the plaited flap.

Cloth sandals were embellished with two fundamentally different types of decoration, one produced by a variation of technique, the other by an introduction of colored wool threads. Woven ornamentations consist of raised triangles with terraced sides, diamond-shaped areas, zigzag patterns, or interrupted transverse bands, all on the surface of the sandal which came in contact with the earth. As nearly as can be determined without tearing the weaving to pieces the raised ornamentations are false embroidery.

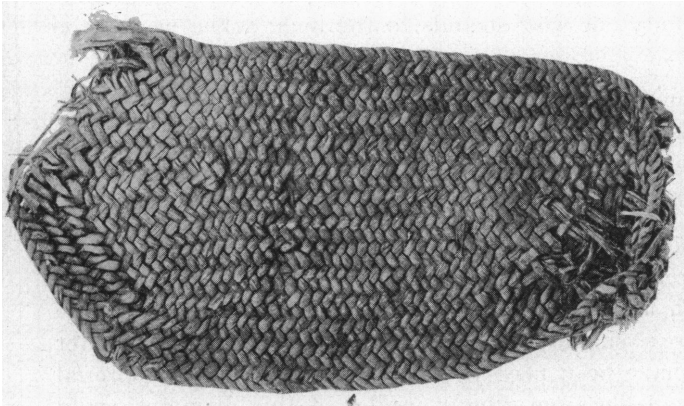


Fig. 29 (29.0-5292). Plaited Sandal. From Room XV², North Wing.

Colored decorations were done in black-brown and black, probably due to different saturations of the same dye, and red and yellow. The patterns are transverse bands, either complete or interrupted, and zigzag or terraced figures (Fig. 28). The designs do not cover the entire sandal, but usually are confined to the region beneath the instep of the wearer. Without exception the heel pieces are colored, some black, some black and red, others the natural yellow brown of the warp strands.

Several specimens have been patched, one with buckskin at both toe and heel, the rest with portions of other twined sandals, sewn with buckskin and yucca cord.

Only one method of attachment to the foot seems to have been used with cloth sandals, all of those at hand having a heel strap and toe loops, such as were described in connection with plaited sandals. None of

them have anything suggestive of a net-like meshwork to enclose the foot. Buckskin, cotton cord, and yucca cord all were utilized for heel straps and toe cords.

As a variant of the cloth type of sandal may be mentioned three specimens, which although twined, are very poorly woven, of coarse cords poorly spun from imperfectly reduced fiber. These do not have the cupped heel and are without decoration.

Woven Headband. The collection contains one woven headband, and portions of several others. The entire specimen is 16 inches long and $1\frac{1}{8}$ inches wide. Warp and woof are of yucca cord, the former of much harder twist and somewhat greater diameter, there being seven warp strands and twenty-one woof strands to the inch. The weaving is twined.

For a distance of about two inches the band tapers towards the ends, which are abruptly rounded. One half inch back from each extremity, the two central warp strands were dropped to leave an eyelet for the attachment of a cord.

Yucca Needles. The Pueblo needle was constructed upon a different mechanical principle than our own. Some pieces of cloth and buckskin are so closely sewn, and the needle holes are so small that needles $\frac{1}{16}$ of an inch or less in diameter would have been necessary to do the work. No material was available from which needles of this diameter could have been made that would have been strong enough to be serviceable when fitted with an eye to carry thread. Even compact deer bone would have been too brittle.

Instead of rigid needles with an eye, flexible fiber needles were used for fine work. Fig. 30 illustrates one of these needles and the method by which the thread was attached to it. To make this needle a strip was split from a yucca leaf, and the basal portion macerated so that only a few strands of fiber remained. The thorn at the end of the leaf afforded an effective point for the needle, and the frayed fiber at the opposite end was twisted in and around the cotton thread. The figured specimen is $2\frac{3}{8}$ inches long from the point at which the thread is attached to the tip.



Fig. 30 (29.0-5436). Yucca Needle with Cotton Cord Attached. From Room XV¹, North Wing.

Braided Ring. A continuous band or ring, unique so far as the present collection is concerned, is illustrated by Fig. 31. It encloses a circle $8\frac{1}{4}$ inches in diameter, which would give the ring a total length of 26 inches if it were severed and extended as a band. For a distance of $8\frac{1}{2}$ inches the ring is double, consisting of two braided strips $\frac{1}{4}$ inch wide, each composed of nine single-ply yucca cords. At the ends these strips are combined into one as shown in Fig. 31. The exact plan of

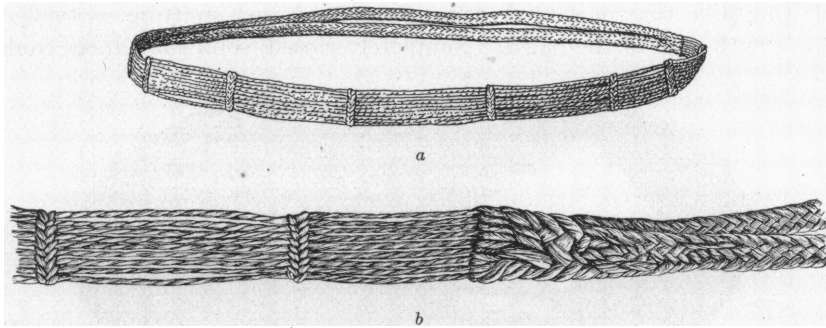


Fig. 31 a (29.0-7730a), b (29.0-7730b). Braided Yucca Ring. From Room 48, East Wing.

intertwining cannot be ascertained without unraveling the weaving. One and three-fourths inches beyond the point of union of the two braided strips, what appear to be the eighteen single-ply cords emerge as nine two-ply cords. These nine cords running side by side and knotted together at intervals of about $1\frac{1}{4}$ inches, composed the other one half of the ring (Fig. 31).

Rush Matting. To judge from the numerous fragments found in every part of the ruin wherein vegetable fiber would have been preserved, mats of rushes were used more extensively than all other textiles combined. It is known that they were used to spread upon the floor, and as an outer wrapping for the dead. There is evidence to support the belief that rush mats served as coverings for beds of boughs and grass, and were hung over doorways, when it was not desired to close these apertures with stone slabs.

The mats range from small to large, $9\frac{1}{4}$ inches by $14\frac{1}{2}$ inches and 41 inches by 50 inches, being the minimum and maximum dimensions observed. Invariably they are rectangular with slightly rounded corners. Plaiting seems to have been the only technique employed and this generally is twilled. No specimens of sewn matting have been found thus far.

Some of the mats are of fine texture, the flattened-out rush stems averaging no more than $\frac{1}{8}$ inch in width, while others are relatively coarse, plaited from strips $\frac{1}{2}$ inch wide. Each mat is surrounded by a diagonally plaited border, which gives additional strength and contributes an ornamental effect. There are no examples of mats decorated in colors.

Plaited Rush Bag. Fig. 32 illustrates a sausage-shaped rush bag 13 inches long, and in its flattened condition $5\frac{1}{2}$ inches wide. The plaiting, like that of sandals and most of the rush matting, is twilled. Since both ends of the bag are completely closed, solid substances could

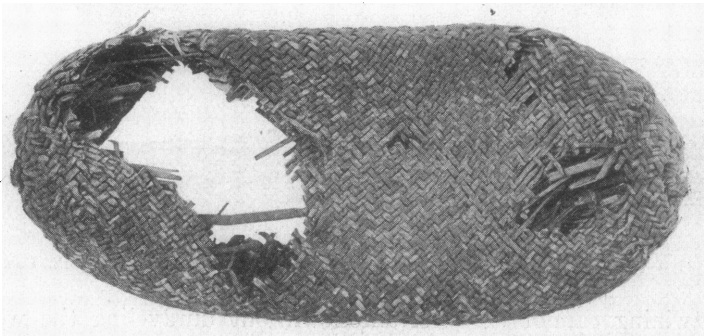


Fig. 32 (29.0-5297). Plaited Rush Bag. From Room XV², North Wing.

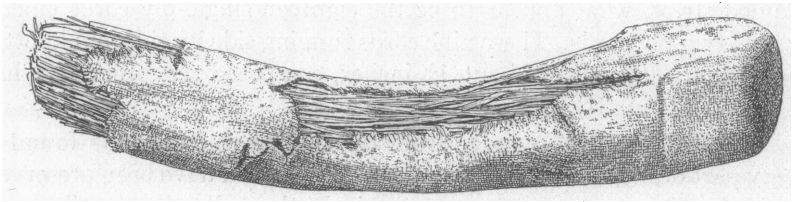


Fig. 33 (29.0-7319). Rush Stem Pad. From Room 49, East Wing.

not have been put in or taken out of it after the plaiting was finished. Originally, this specimen was stuffed with corn tassels, inserted during the process of manufacture. The stuffing and the signs of wear on both sides of the flattened bag indicate that it was used for a pad or a pillow.

Rush-stem Pad. A pad of undetermined specific function consists of a roll of rush stems enclosed in a cloth cover (Fig. 33). Originally the roll was of cylindrical form, about $1\frac{1}{4}$ inches in diameter and 12 inches long. As a result of pressure, the central part is flattened, and the ends curved slightly upward, imparting to the pad a bow-like contour when it is viewed from the side.

One end of the cotton cloth covering is missing. The other is neatly sewn together. Diagonal patterns of red and black are faintly traceable running through the fabric.

The shape of the pad suggests that it might have been used as a pillow or perhaps as a protective layer between the forehead and a burden strap. That this pad represents a definite type and is not the result of individual caprice may be inferred from the fact that the collection contains three other rolls of rushes, similar to the one described except for the absence of the cloth cover.

Willow Matting. Two kinds of willow matting are distinguishable: one probably intended only for ornamental purposes, the other for actual utility.

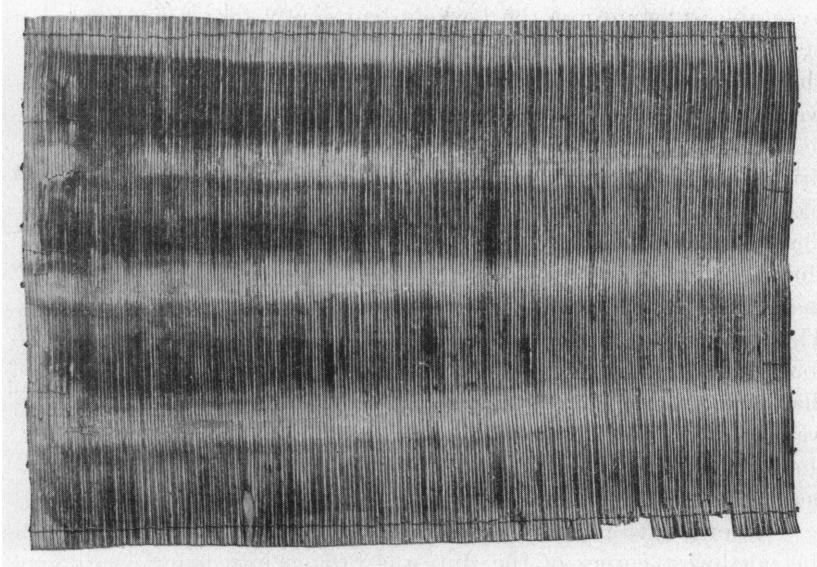


Fig. 34 (29.0-8063). Ornamental Willow Mat. From Room LX, North Wing.

Five ornamental mats were taken from a partly fallen ceiling, where they had been placed as a decorative finish between the longitudinal ceiling timbers, and the cedar splints which supported the mud floor of the room above. Of the five specimens, the most complete is 31 inches by 45 inches, consisting of 223 peeled willows, pierced and strung on nine yucca cords (Fig. 34). The willows are round, not flattened, evenly graded, and approximately the same size throughout their length, averaging 21 inches in diameter.

Only one mat of the kind used upon the floors, for wrapping the dead, etc., was found, and that could not be preserved. It was 2 feet long by 2 feet 7 inches wide, and consisted of sixty-eight willows strung on ten yucca cords. One side of the willows had been flattened so as to give the mat a flat instead of a transversely ribbed surface. On the back of the mat the bark had not been removed from the willows. The individual elements were larger than those of the ornamental mats, averaging about $\frac{1}{2}$ inch in diameter.

Baskets. Although there are few examples of basketry in the present collection the meager material is sufficient to demonstrate that the aborigines of the Aztec Region were familiar with two types of basketry technique: coiling and plaiting. Based upon observations of decayed specimens found with burials and of impressions in the soil where the vegetable substance of the baskets had completely disintegrated, the statement may be made that three shapes of coiled baskets were manufactured, plaque-like, bowl-shaped, and cylindrical. The largest plaque-like basket was 13 inches in diameter, while one bowl-shaped basket was $10\frac{1}{2}$ inches in diameter, and 5 inches deep. The only cylindrical basket found measured 6 inches in diameter and 3 inches of the walls remained, but originally the depth of the basket had been considerably greater.

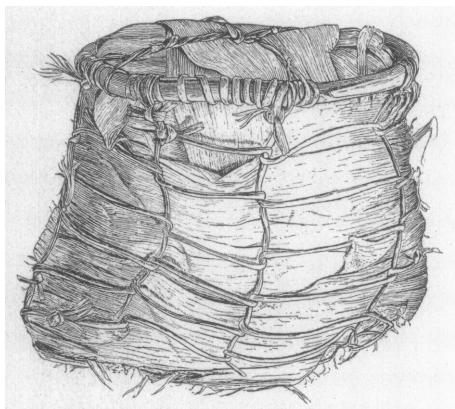


Fig. 35 (29.0-5310). Basket-like Container.
From Room XV², North Wing.

According to the statements of individuals who were present when the northwest corner of the ruin was broken into many years ago, a number of excellent coiled baskets perfectly preserved were found in one of the rooms. The present resting place of these specimens is unknown.

Only two rather carelessly made plaited baskets have been exhumed. The larger one is $9\frac{3}{4}$ inches in diameter and quite shallow, but so distorted that its actual depth cannot be determined. The smaller one is $3\frac{1}{2}$ inches in diameter and $1\frac{1}{4}$ inches in depth. This may very well have been a sieve. A detailed discussion of technique and materials will be left to the future because of the probability of finding a more complete series of baskets by the time the excavations are finished.

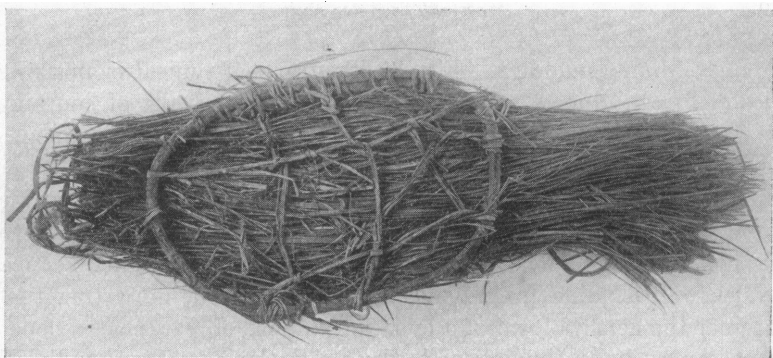
Basket-like Containers. Fig. 35 illustrates a typical example of a series of fifteen objects which obviously were some sort of containers, but whose specific function or functions remain to be determined. A withe bent into an oval or circular loop, its ends bound together with strips of bark or yucca leaf, is the foundation of each of these containers. A more or less complicated lacing of yucca strips constitutes the bottom. The sides consist of a loose meshwork of strips of yucca carried vertically upward, or becoming progressively more restricted, imparting to the container the general form of a cylinder, or that of a truncated cone, as the case may be. A lining of husks made the containers sufficiently tight to have held beans, corn, or even smaller seeds. The figured specimen is slightly oval, $4\frac{1}{8}$ inches and $5\frac{1}{2}$ inches being the diameters of the base, and 6 inches the height of the container.

Snowshoe-like Pads. There is a series of four objects similar in the fundamentals of construction to the containers just described but intended for a different use. The framework of each consists of an oval withe loop. This is crossed by one lacing of yucca strips drawn taut and another which bags slightly. In two cases the space between the lacings is filled with cornhusks, not wadded, but lying flat, parallel to the long axis of the withe rim (Fig. 36b). The other two are filled with compact bundles of grass the ends of which extend a few inches beyond the extremities of the withe loops (Fig. 36a).

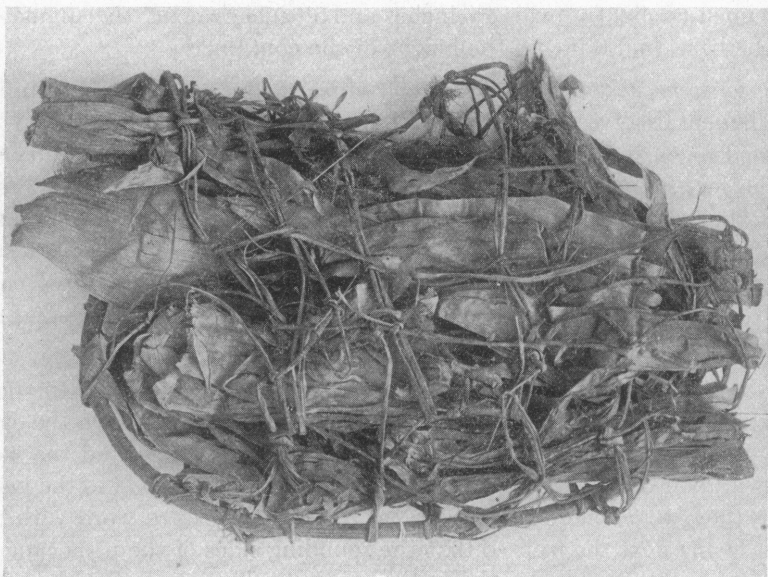
It has been suggested that such pads were used to protect the back when burdens were being carried. While such may have been the case, the fact that the four pads constitute two distinct pairs, and the wear shown upon the lower sides of those of one pair, incline one to the belief that they were some sort of footgear. If so, they were worn with the taut lacing next the feet, so that the rounding sides of the pads came in contact with snow, or earth, as the case may have been. Although a meager protection, they would have helped considerably to protect sandaled feet from light falls of snow. Moreover, an individual wearing such pads could have gone where he wished without the least danger of being identified by tracks left in mud or sand.

The length of the withe frame of Fig. 36a is 8 inches; and that of the frame of Fig. 36b is 16 inches.

Reed-stem Cigarettes. Reed-stem cigarettes are numerous in all dry refuse at Aztec. A typical cigarette consists of a section of *phragmites* stem about 2 inches long, cut so that a joint was left somewhat nearer one end than the other. The septum closing the stem at the



a



b

Fig. 36 *a* (29.0-5319), *b* (29.0-5322). Snowshoe-like Pads. From Room XV², North Wing.

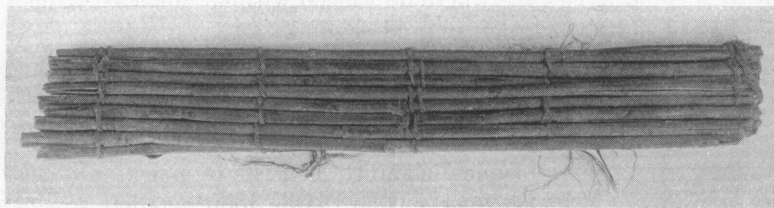


Fig. 37 (29.0-5335). Cylindrical Reed-stem Container. From Room XV², North Wing.

joint was punched out, the material to be smoked, perhaps willow leaves, was stuffed into the short end of the reed, and the long end was used as a mouthpiece.

Cylindrical Reed-stem Containers. Fig. 37 illustrates a cylindrical container, length $12\frac{1}{2}$ inches, made of stems of *phragmites*, laced at intervals with twined cords of yucca fiber. The function of these containers is not entirely clear, but it is probable they were sheaths for the protection of feathers and plumes used in ceremonial rites. One of these reed-stem cylinders is enclosed in a wrapping of cornhusks, bound in place with yucca cord.

Arrows. If the material in the present collection may be used as a basis for generalization, the reed arrow was the only type used. Of twenty-nine specimens two are entire. One, Fig. 38, is $32\frac{1}{2}$ inches long, the other only $11\frac{1}{4}$ inches. To judge from the fragments these two represent about the extremes in length.

All of the arrows have foreshafts of hard wood, usually made from the stems of chico brush. If they were to be used without a stone tip, the foreshafts taper to a rather abrupt point, while those tipped with arrow points are of nearly uniform size throughout their length. The maximum diameter of the foreshaft is the same as the diameter of the reed into which it is fitted. A square shoulder was cut around the foreshaft a short distance from the end opposite the point and the remaining length of the stick pared away sufficiently to allow the wood to slip into the reed until the end of the tubular stem fitted snugly against the shoulder of the foreshaft. Sinew was then wrapped around the end of the reed to prevent the latter from splitting.

A short plug of wood was driven down flush with the opposite end of the reed, the nock was cut in the solid cylinder composed of wood and reed, and sinew was bound around below the nock to prevent splitting when the bow cord was drawn.

The rear feather binding is on the average $1\frac{1}{4}$ inches forward of the nock. The three feathers were attached at both ends with wrappings of sinew.



Fig. 38 (29.0-7747). Reed Arrow with Wooden Foreshaft. From Room 48, East Wing.

The arrows were variously painted between the nock and the forward feather attachments. One has a wide band of black encircling the shaft just forward of the rear feather attachment. One has a band of red in front of the rear feather attachment, and a band of green forward of the nock wrapping. On another the entire area between the feather attachments is filled with narrow equally spaced encircling lines of red. Two are red between the feather attachments, each with a wide green band just below the nock wrapping.

The dimensions of the figured specimen are: total length $32\frac{1}{2}$ inches; length of foreshaft from tip to shoulder $7\frac{1}{2}$ inches; distance from neck to feathers $1\frac{1}{4}$ inches; length of feathers $5\frac{1}{2}$ inches.

Only one fragment of a bow has been found. This, a piece of one end, is $4\frac{1}{2}$ inches long, fashioned from straight-grained cedar. There are marks of wrappings over about one half of its length.

Corncob Darts. The collection contains two objects which appear to have been used as darts, probably children's playthings. One consists of a section of a corncob $1\frac{1}{2}$ inch long, through the pith of which a broken arrow $8\frac{1}{2}$ inches long has been thrust, the end of the foreshaft extending $\frac{3}{8}$ inch beyond the cob. The other dart is the same except that a stick was used in place of the broken arrow.

Jar Rests. Jar rests or pot rings are conspicuous among the deposits of dry refuse. As the name indicates, they are rings used to support vessels with convex bottoms which would not stand upright by themselves, and presumably were also pads to protect the heads of the carriers when water or other substances were transported. In diameter they vary from $2\frac{1}{4}$ inches to 7 inches. A considerable diversity of material was utilized in their manufacture. From the carelessness with which some of the rings were made it is to be supposed that many of them were improvised upon the spot from the first materials at hand. Some are thick and springy, others quite thin. Jar rests have been figured in so many publications that it is not considered necessary to give illustrations of them here. Of the total number, fifty-six, the material from which they are manufactured may be given in tabular form:—

Cedarbark	15
Cedarbark wrapped with yucca strips	13
Cedarbark wrapped with cornhusks	3
Cornhusks or leaves	15
Grass	2
Twigs	1
Twigs wrapped with husks	2
Plaited material (rush leaves or yucca)	5

In addition to the jar rests there are fifteen smaller rings similar in construction but too small to have been useful for supporting vessels. Some of the smaller ones, $\frac{1}{2}$ inch to inch $\frac{3}{4}$ in diameter, might have been worn upon the fingers. In lieu of any other explanation one is tempted to call these rings ceremonial objects, but whether they were intended for some function which has not yet been suggested, whether they were used in games, or were of a ceremonial nature cannot be stated definitely at this time.

Hair Brushes. Aboriginal hair brushes from Aztec resemble those still used by some Southwestern tribes. Each brush is a cylindrical bundle of narrow strips of yucca leaves, or of stiff grass stems, wrapped, bound, and tied midway of its length with a cord (Fig. 39). The range of length of the seven specimens in the present series is from 6 inches to 9 inches. The average diameter is about $1\frac{1}{4}$ inches.

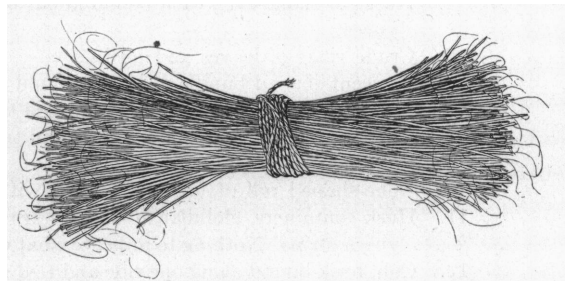


Fig. 39 (29.0-7735). Hair Brush. From Room 48, East Wing.

There were 210 strips in a brush whose strands were counted. Both ends of the brushes retain combings, and show about equal wear, indicating that there was no preference as to which end was applied to the head.

Miscellaneous Objects of Vegetable Fiber. A great many objects of vegetable fiber are sufficiently undifferentiated or have too little specific individuality to render them amenable to description without a tedious and profitless repetition of detail. Nevertheless, they should not be passed by without mention. For the sake of brevity and convenience they are arranged in the following outlines which give the materials of which they are made, the general groups into which they fall, and occasionally a few words suggestive of their hypothetical functions.

A. Yucca leaves.

1. Strips tied together at ends—lashings for beams, bundle ties, burden straps, etc.
2. Bundles of strips, knotted at ends.
3. Bundles of split leaves, tied with strips.
4. Small bundles of finely split leaves tied with strips.
5. Small rings made of strips.
6. Large rings made of strips.
7. Meshwork of strips.

8. Bundles of strips and fiber enclosing masses of (piñon?) pitch.
 9. Strips, incipient plaiting, daubed with pitch.
 10. Strips, partly plaited, no definite form of object.
 11. Hanks of fiber freed of pulp. Probably material for making cord.
 12. Quids of fiber, seem to have been chewed.
 13. Mushroom-shaped wad of fiber, stem wrapped with yucca cord.
- B. Corn leaves and husks.
1. Husks of two ears stripped back and knotted together at ends. Corn hung up to dry in this fashion.
 2. Stems of many ears, husks adhering, strung on osier loops like keys on a ring. Such rings of corn were hung up to dry, subsequently ears were broken off as wanted for use.
 3. Husks, knotted.
 4. Husks of single ears, each bound about middle and tied with strips of yucca.
 5. Crude rings of leaves and husks.
 6. Crescent-shaped bundle of leaves bound about middle with corn leaf.
 7. Bundles of leaves and husks bound and tied with strips of yucca.
 8. Bundles of leaves and husks bound and tied with yucca cord.
 9. Pad-like wads of husks.
 10. Yoke-shaped roll of husks, wrapped with husks, ends charred.
 11. Husk containers, globular, oval, cylindrical, enclosed in meshwork of yucca strips. Nothing to indicate what was stored or carried in them.
 12. Cob, husk bound along one side and tied in place with strip of husk.
 13. Cobs and leaf wrapped in husk, bound and tied with yucca cord.
 14. Small husk packages, globular, flat rectangular, tied with strips of husk.
 15. Quids of chewed or macerated husks and leaves. Sometimes used as tinder.
- C. Cedarbark.
1. Crescent-shaped roll of bark wrapped with cornhusk.
 2. Slow-match or torch—a slender roll of bark, tied at intervals with yucca strips.
 3. Brush. A compact bundle of unshredded bark. One end is square-cut, and smeared with mud, some of which has been forced back among the fibers. Probably used to smooth plaster on walls, surface floors, etc.
- D. Miscellaneous.
1. Bundle of herbs.
 2. Bundle of herbs (white sage).
 3. Bundles of grass stems.
 4. Bundles of bunches of grass, each bunch cut off below the crown.
 5. Bundles of grass plants, nearly all of root systems attached.
 6. Bundles of grass roots.
 7. Bunches of wild oat stems and heads.
 8. Roots of rushes.
 9. Corncobs—twelve and fourteen rows.
 10. Corn tassels.
 11. Brown beans.

12. Brown beans in pods.
13. Cones of rock pine.
14. Cones of spruce.
15. Cotton seeds.
16. Yucca seeds.
17. Squash rinds and seeds.
18. Gourd shell—part of bottle.
19. Piñon twigs and needles.
20. Rock pine twigs and needles.
21. Bundles of cedar twigs and needles.
22. Stems and twigs of "Mormon Tea."
23. Bunches of willow twigs and leaves.
24. Piñon pitch.

Skins of Animals. A hundred or more portions of the skins of animals were taken from the dry refuse in Room 48. For the most part these are discarded edges and trimmings of tanned hide, including only a few fragments of, and three complete, manufactured articles. Because of the paucity of objects of definite form, the following list, essentially a copy of the catalogue, is given instead of extended description.

1. Pieces of deerskin with hair on.
2. Trimmings from tanned hides. Edges perforated where hides were staked out to dry.
3. Pieces of tanned hide, stiff and hard.
4. Pieces of tanned hide, soft and flexible.
5. Leather strings.
6. Leather strings, fringed.
7. Piece of soft tanned hide, fringe on edges.
8. Piece of soft tanned hide, sewn.
9. Piece of soft tanned hide, wrapped with leather string and yucca cord.
10. Piece of tanned hide, green pigment on one surface.
11. Part of hide sack, red pigment on interior.
12. Moccasin toe of soft tanned hide, red stain.
13. End of leather sack, yucca puckering string.
14. Minute leather bags (3) sub-spherical in shape, one painted red with puckering string of sinew.

Most of the fragments are of deerskin, but there is the head of a badger skin, and some portions of prairie dog skins in the lot.

Most of the hides were hard-tanned resembling rawhide, but the finer specimens are as soft and flexible as chamois. The sewing exhibited by some of the fragments is neatly and skillfully done with thread of yucca fiber, or of cotton.

Hoof Rattle. Several deer or antelope hoofs, each pierced near the upper edge and strung on yucca cords were found among the dry refuse. Presumably these were portions of a rattle.

Feathers. Few feathers have been found, but inasmuch as unusually favorable conditions are necessary for their preservation, the dearth of specimens need not be considered to indicate that feathers were less conspicuous in ceremonials at Aztec, than they were in the ceremonials of other Pueblo groups. The specimens at hand, probably the remains of prayer plumes, may be described as follows: two bundles, one containing six, the other seven feathers from the wings of hawks, with quills pierced and strung on yucca cords; one large feather, its quill driven through the pith of the stem of a corn ear; and several tufts of downy feathers (white and brown) each attached at the base to a slender yucca cord.

For the sake of completeness there may be mentioned here one macaw feather, still retaining its brilliant colors of red and blue. This feather is one more proof of commerce with the tribes of Mexico.

OBJECTS OF UNBURNED CLAY.

Although it is probable that a considerable number of objects of unburned clay were used, few have been found. Wherever moisture penetrated, the clay has returned to earth and it is only in conditions of absolute dryness that artifacts of unburned clay are preserved.

The collection contains three roughly conical plugs, each with a shoulder nearer the larger than the smaller end. From the shape of the objects, and the configuration of the shoulder, it seems that they were used as stoppers for large jars. Fig. 40 is $2\frac{7}{8}$ inches high and 4 inches in maximum diameter.

There are four wads of clay, two apparently jar handles in process of manufacture, one of the foot of an animal figure, the fourth a sort of cylinder which has resulted from squeezing a lump of wet clay with a full-hand grip.

In two chunks of adobe there are impressions of the forward ends of footprints of the right foot and another piece bears a plain impression of cloth.

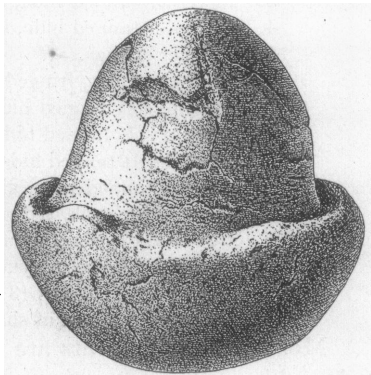


Fig. 40 (29.0-7529). Clay Jar Stopper.
From Room 48, East Wing.

POTTERY.

Structure and Composition. A detailed discussion of pottery structure cannot be attempted at this time. As a generalization it may be said that the paste is relatively homogeneous, fine-grained, and hard. Minute flakes of mica are occasionally present, but are not conspicuous. It seems improbable that ground potsherds were used as a component of the paste. Such relatively large granules as do occur are of a color and form which indicate that they are grains of sand or minute lumps of clay. However, it is merely here intended to raise the question, and not to assert definitely that ground potsherds were not utilized by the potters of the Aztec Pueblo.

The ultimate color of the paste was determined by the temperature of the fire in which the vessel was burned, and the duration of its exposure to the flame. If the heat were not intense, the central portion of the vessel walls is dark gray, at times almost black in color, only a thin film on either side having been burned to a light gray or whitish tone. The paste of the thoroughly burned vessels is the same color throughout—a light slightly bluish gray.

With rare exception the interior surfaces of bowls were covered with a light, sometimes almost chalk-white slip, which, when smoothed and polished, furnished the ground color upon which the black designs were applied. The exteriors of bowls were less frequently treated with a slip.

It may be safely asserted that coiling was the dominant, if not the exclusive, technique employed.

As compared with more recent Pueblo pottery the vessel walls are thin, $\frac{7}{32}$ inch being about an average. From this there is considerable variation, $\frac{3}{32}$ inch and $\frac{1}{2}$ inch being the minimum and maximum observed.

Corrugated Ware. Corrugated cooking vessels were used in great numbers. From sifted refuse deposits, the quantity of fragments of corrugated ware is about the same as the total quantity of fragments of all other kinds of pottery.

Globular bodies with short abruptly recurving necks constitute the characteristic form. Usually the recurved neck is plain, but in some cases the spiral coiling was continued to the edge of the rim. Normally the coils are in high relief. There were occasional attempts to embellish the vessels with decorations other than those produced by the customary manipulation of a spiral coil. One method was to vary the width of the

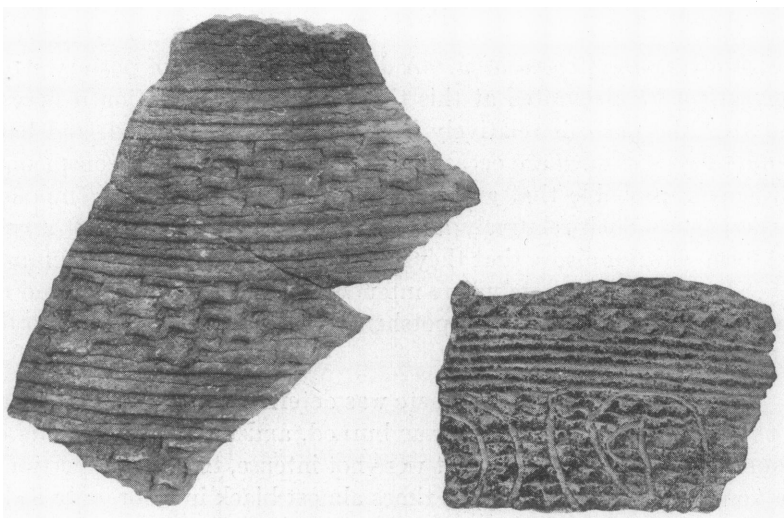


Fig. 41. Ornamented Corrugated Ware Potsherds. From Kiva D, East Wing.

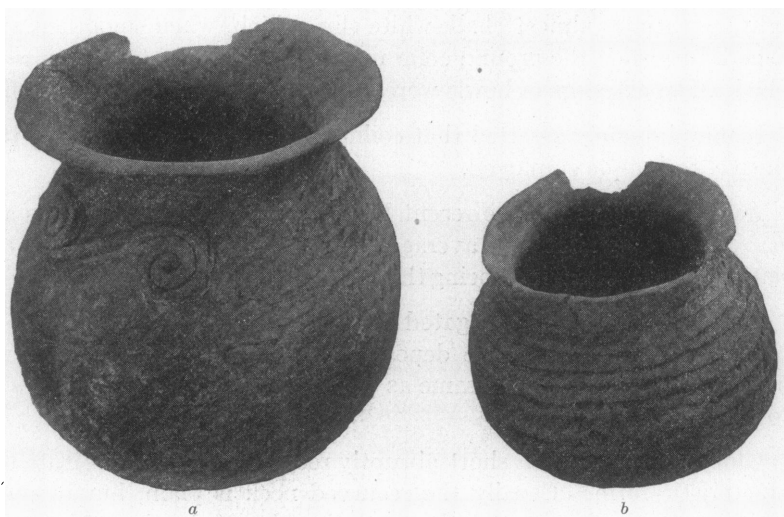


Fig. 42 *a* (29.0-6738), *b* (29.0-7919). Corrugated Cooking Vessels. *a*, from Grave 8, Room 27, East Wing; *b*, from Grave 16, Room 41, East Wing.

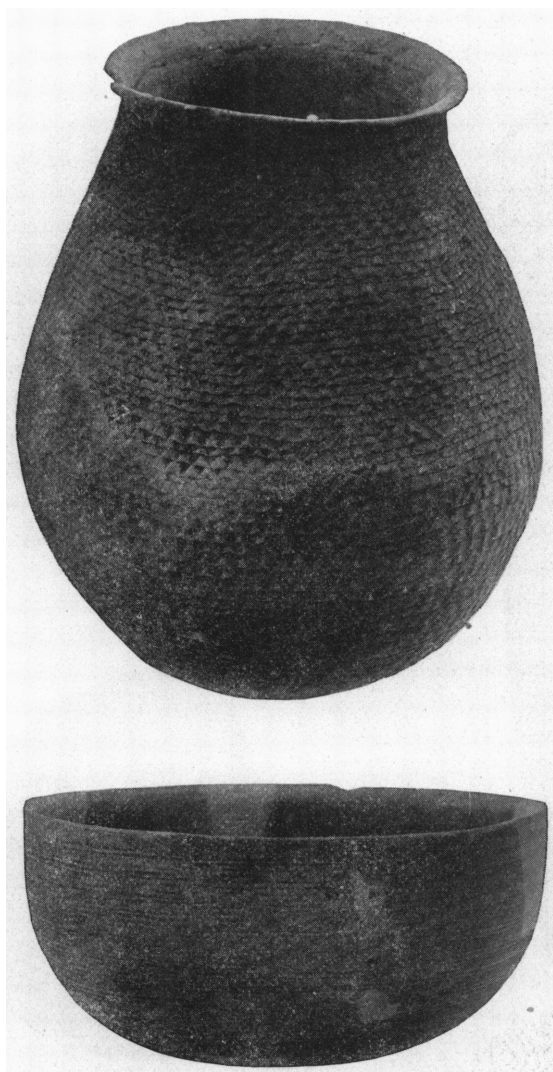


Fig. 43 (29.0-5206c, 7864). Corrugated Cooking Vessel and a Bowl of the Tularosa Type. a, from Room 9, South Wing; b, from Room 57, East Wing.

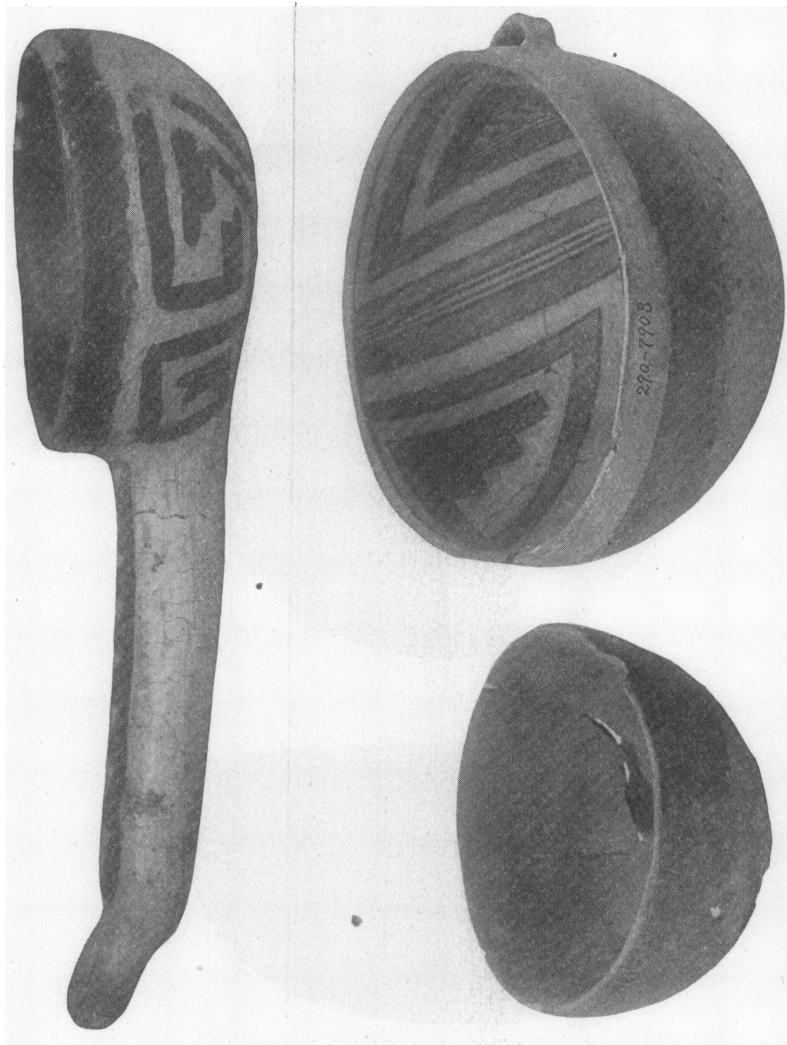


Fig. 44 (29.0.7904, 6981, 7903). Three-color Ware Bowl and Dipper and an Archaic Type Red Bowl. *a*, *c*, from Grave 16, Room 41, East Wing; *b*, from Room 47, East Wing.



Fig. 45 *a* (29.0-7903), *b* (29.0-5222). Three-color Bowl and a Red Bowl of the Little Colorado Type. *a*, from Grave 16, Room 41, East Wing; *b*, from Room 20, East Wing.



Fig. 46 (29.0-7128). Rectangular Bowl of the Tularosa Type. From Room 51, East Wing.

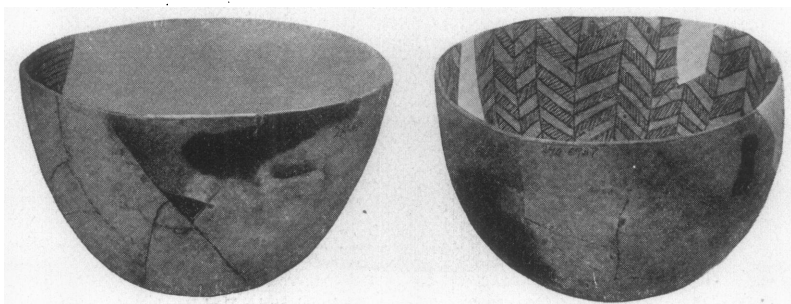


Fig. 47 (29.0-6987, 6937). Black-on-white Bowls, Archaic Type. a, from Room 46, East Wing; b, from Room 47, East Wing.

coils, as well as the pressure of the thumb, and the direction in which the pressure was applied. Fig. 41a illustrates ornamentation produced in this way.

Rarely a sharp pointed tool was used to incise designs upon a coiled surface (Fig. 41b). Occasionally spiral fillets of clay were applied over the coils to produce raised ornamentations (Fig. 42a).

The cooking pots range from 3 inches in height and 3½ inches in diameter (Fig. 42b) to 13½ inches in height, and 12½ inches in diameter (Fig. 43a). However, the larger one does not represent the maximum. Some fragments represent vessels which had fully twice as great a cubic content.

None of the corrugated jars in the collection have handles. However, portions of small vessels of this ware, each with one loop handle extending from the neck to the girdle of the pot, are occasionally found among the refuse. Handles seem never to have been applied to the large corrugated pots.

Smooth Undecorated Ware. The collection contains one small bowl devoid of painted ornamentation. Plain ware of this variety is seldom found in the Aztec Region.

Redware. There are two types of redware at Aztec. The first consists of vessels whose interior and exterior surfaces have red for a ground color, and are ornamented with designs of black upon the concave surfaces of bowls and upon the convex surfaces of vessels of globular form. This type is relatively archaic and seems to be correlated with black-on-white pottery over all of the upper San Juan Area, but is nowhere present in large numbers. There is only one complete specimen in the collection from Aztec (Fig. 44b). The range of form was restricted, to judge from fragments gathered from refuse deposits. Bowls were most common and occasionally there were globular vessels or heart-shaped bowls and pitchers; but very rarely a dipper or jug.

Two kinds of paste compose the vessel walls of the archaic redware. One is friable, granular, and of a yellow or light red color. The other is hard, homogenous, and slaty gray in color. Regardless of the color of the paste, it was covered with a red slip.

Both hachured and solid black elements appear in the decoration of these vessels. The designs were applied after the same general plans that were employed in the ornamentation of black-on-white ware.

Bowls are the only form of vessels of the second type of redware appearing in the collection. The ground color of the interiors is red and the designs are done in black, hachured and solid, or these two in com-

bination (Fig. 45b). In diameter, these bowls range from 8 inches to 11½ inches and are hemispherical in form. Only one instance of the broken life line has been observed.

Rough, heavy line patterns have been traced upon the exteriors in cream color or light yellow, or in some cases the entire outside of the vessel was covered with a wash of cream or yellow, and the designs applied in red.

A striking similarity is at once apparent between this type of ware and the red pottery typical of the Little Colorado Area. Either vessels of this type were traded in from that region or were made by potters who were familiar with the technique commonly employed by their neighbors to the southwest.

There might also be mentioned fragments of red bowls with an orange tint decorated with black sub-glaze. Such vessels are also found in the drainage of the Little Colorado as well as in the earlier ruins in the Rio Grande Valley. They seem not to have been local products at Aztec.

Two red bowls with corrugated exteriors are represented each by a single rim fragment. The individual coils are in low relief. Black designs constitute the interior decoration. Evidently vessels of this character were importations.

One small bowl has an animal's head in relief on the exterior a short distance below the rim. Apparently this was intended to serve as a handle. It is the only instance observed of figures in relief upon redware.

Three-color Ware. A typical specimen of three-color ware is a bowl 10¾ inches in diameter and 5¾ inches deep (Fig. 45a), with a heavy loop handle on one side, 1½ inches below the rim. The ground color of the interior is orange-red, upon which the design has been traced in deeper red and outlined with black. Light red is the ground color of the exterior, broken only by a single broad band of dark red drawn around the bowl in line with the handle.

One three-color dipper was found with this bowl (Fig. 44a). The interior of the bowl is red, with black decoration, save for a gray rectangle in the bottom. Gray is the color of the handle and the exterior of the bowl. Upon both there are red designs.

Such three-colored vessels were found in Pueblo Bonito and range westward into northeastern Arizona, where they are relatively plentiful, and seem to have been manufactured.

Part of one large bowl illustrates another type of three-color ware. Red is the ground color of both interior and exterior. Upon the interior

the decoration consists of interlocking solid and hachured elements. The hachure is done in black, while the solid elements have been drawn in dark red, and outlined in white. White terraces and spirals constitute the exterior decoration. Similar color combinations are found on pottery from northeastern Arizona.

Brown-and-Blackware. Although no entire specimens have been recovered, fragments show that what is here called brown-and-blackware was known and used at Aztec. Vessels of this ware have an exterior color varying from dark brown to brick red, whereas the interiors are a glossy, sometimes iridescent, black. In no instance is there evidence of the application of painted designs.

Hemispherical bowls are the characteristic form, most of them small—up to ten inches diameter. There are a few fragments of vessels of this sort corrugated on the outside.

As one goes southward, brown-and-blackware becomes more plentiful. Numerous vessels are in the collection from Pueblo Bonito. In the Zúñi Region such ware occurs with great frequency and present knowledge indicates that the Zúñi Area was the center in which it was originally manufactured.

Tularosa Type of Corrugated Ware. The collection contains two more or less complete vessels and a few fragments representative of a ware which belongs unmistakably to the type of finely corrugated pottery most conspicuous among collections from the Tularosa Region in southwestern New Mexico (Fig. 43b).

One of the specimens is a hemispherical bowl $9\frac{1}{4}$ inches in diameter and $4\frac{3}{4}$ inches deep. The interior of the bowl is a glossy jet black and the exterior a dark mottled brown. On the exterior the rim is plain for a distance of $\frac{3}{8}$ inch. Below the rim there is one plain coil succeeded by a series of two very narrow coils, each marked at intervals of about $\frac{1}{32}$ of an inch with transverse grooves. Then follow two plain equally narrow coils, in slightly higher relief. This sequence of elements is repeated until the bottom of the bowl is reached. The walls of the vessel are relatively thick, $\frac{5}{16}$ of an inch. The coiling is done spirally.

The other bowl is rectangular in form, $7\frac{1}{4}$ inches by $3\frac{3}{8}$ inches by $2\frac{1}{2}$ inches deep. From the very slightly concave bottom the sides rise abruptly, but not quite at right angles. The interior is black, the exterior mottled red-brown to black. A row of five spirally coiled disks longitudinally placed, constitutes the central panel of the bottom of the bowl. Around this panel the spiral coiling, neatly conformed to the rectangular area, begins and proceeds continuously to a point halfway

up the sides. Equally spaced transverse tool-marks are drawn across the coils of this part of the vessel. A heavy band, plain on its upper edge and tooled on the lower, in much higher relief than the other coils, divides the sides of the vessel into two zones. Above it the narrow coils are not tooled as they are below, but interlocking key patterns have been incised upon this area (Fig. 46). The rim of the vessel is plain, and the walls are thin, $\frac{3}{16}$ inch. Unquestionably, this exquisite vessel is an imitation of a basket.

Black-on-white Ware. No rational observer would doubt that Pueblo occupation of the Aztec Region lasted through several centuries. It is difficult to imagine a culture trait capable of so much change and elaboration as the potter's art, remaining stationary through so long a time, even in a very conservative group. Almost of necessity, styles of form and ornamentation would have their vogue and slowly be supplanted by something recognizably distinct.

Thus far little definite stratigraphic superposition has been observable in the Aztec Ruin, but that little has been sufficient to establish a difference in form and style of ornamentation between two types of bowls. In older refuse piles, and sealed beneath floors which have been laid over débris accumulated during abandonment of certain sections of the ruin, are found numerous fragments, and rarely more or less complete specimens of bowls which were very deep in proportion to the diameter, a representative specimen being $10\frac{1}{4}$ inches in diameter, and 6 inches deep (Fig. 47b). Many of the vessels had two handles, consisting of loops or flat protuberances, on opposite sides of the vessel, from one to two inches below the rim (Fig. 47a).

Hachured elements are conspicuous in the ornamentation of this type. In no instance has painted ornamentation been observed on the exterior surfaces of these deep, relatively more ancient, bowls.

The typical form of bowls of the later period is that of a section consisting of somewhat less than half of a hollow sphere, the depth of the bowls always being less than half of the diameter. In a series of 105, one is flat-bottomed, and the bottom of another is somewhat concave. One has a slightly flaring lip or rim. The rims of the others are flat or slightly rounding on top. In size, the series of 105 ranges from diameter $3\frac{3}{8}$ inches, depth $1\frac{3}{4}$ inches; to diameter, $12\frac{1}{2}$ inches, depth $5\frac{1}{4}$ inches.

A number of fragments, and three more or less complete bowls represent a variant of black-on-white ware which combines the technique of both black-on-white and corrugated ware. Bowls seem to have been the only form. The exteriors were spirally coiled and indented with

the thumb, whereas the interiors were finished in the usual manner—smoothed, covered with a slip, polished, and ornamented with black patterns.

Only three fragments of vessels moulded in baskets were found among the ton or more of potsherds from the east wing of the ruin. This gives some idea of the relative scarcity of basket-moulded vessels in the Aztec Region. Each of the fragments is from a different bowl. The bowls were medium size—perhaps 9 inches in diameter—and in each case the mould was a coiled basket. Two of the three were ornamented on the interior with black designs. The third seems to have been without interior decoration, but upon the exterior surface, a brick red pattern was painted over the basket impression.

Fragments of globular bowls with more or less flat tops and relatively small circular mouths are seen quite frequently in refuse deposits, but there are only two more or less complete specimens in the present collection, and even these were recovered from refuse. One has a maximum diameter of $4\frac{3}{8}$ inches, a height of $2\frac{3}{4}$ inches, and a mouth $2\frac{1}{8}$ inches in diameter. The other is $10\frac{3}{8}$ inches in diameter, $7\frac{1}{8}$ inches in height with a mouth $3\frac{3}{8}$ inches in diameter. All decoration is upon the exteriors of vessels of this type.

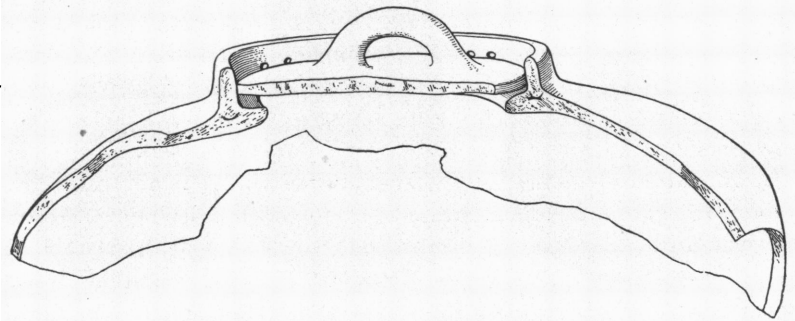


Fig. 48 (29.0-6189). Vertical Section of Jar with Rim and Cover Flange.
From Kiva, Ruin 1, Cortez, Colorado.

It would appear that globular vessels without some form of rim or neck passed out of use a considerable length of time before the pueblo was abandoned.

Globular vessels with rim and flange are presumably an outgrowth of globular bowls. The construction of the body of the vessel was the same in both cases, but to the former a feature was added which sets them apart as a distinct type. A circular wall of clay was erected upon the

top of the vessel concentric with, and somewhat larger than the orifice of the pot. The extension of the sloping vessel walls within the vertical rim provides a flange for the support of a lid (Fig. 48).

The range of dimensions of the four specimens in the collections is from, height $4\frac{1}{4}$ inches, diameter $7\frac{1}{4}$ inches, diameter of mouth 3



Fig. 49 (29.0-7907, 7905). Black-on-white Jars. *a*, a water jar, Grave 16, Room 41, East Wing; *b*, jar with rim and cover flange, Grave 16, Room 41, East Wing.



Fig. 50 (29.0-5157, 6988, 7909). Black-on-white Water Jar and Pitchers. *a*, from Room 2, South Wing; *b*, Bonito type, Room 47, North Wing; *c*, Aztec Type, Grave 16, Room 41, East Wing.

inches, width of flange $\frac{1}{2}$ inch, height of rim $\frac{1}{4}$ inch; to height $9\frac{1}{4}$ inches, diameter $11\frac{1}{8}$ inches, diameter of mouth $3\frac{3}{8}$ inches, width of flange $\frac{3}{4}$ inch, height of rim $1\frac{1}{4}$ inches.

One vessel has opposite pairs of perforations through the base of the rim, and one has four pairs of them, equally spaced. It is suggested that these were for the insertion of thongs with which to lash the lids in place. Fig. 49b is a characteristic specimen.



Fig. 51 (29.0-7910, 6756, 7911, 7914, 6755, 6737). Black-on-white Mugs. a, c, d, from Grave 16, Room 41, East Wing; b, e, from Kiva D, East Wing; f, from Grave 8, Room 29, East Wing.



Fig. 52 (29.0-7915). Black-on-white Globular Mug. From Grave 16, Room 41, East Wing.



Fig. 53 (29.0-6905, 6758). Black-on-white Dipper. *a*, from Room 44, East Wing; *b*, from Kiva D, East Wing.

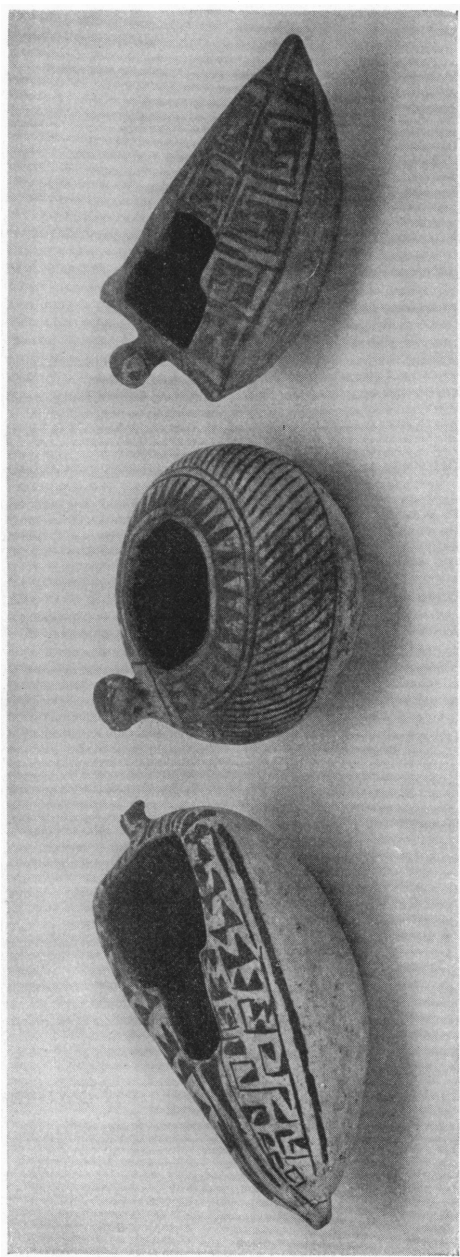


Fig. 54 (29.0-7917, 7916, 7918). Black-on-white Bird Form Vessels. From Grave 16, Room 41, East Wing.

Although plentifully represented by fragments from the refuse deposits, only five water jars have been recovered more or less entire. The body forms vary from sub-spherical to somewhat depressed. Normally the bottoms are slightly concave, but some of the smaller specimens lack this feature.

The necks rise vertically, are inclined slightly inward, or slope more abruptly inward, and merge into the base of a recurved rim. In proportion to the size of the vessels, the necks are small. Each pot has two handles.

Based upon the position of the handles two types of water jars may be recognized. One consists of relatively large vessels, upon which handles are placed on the sides at the point of greatest diameter (Fig. 49a); the other of smaller vessels upon which the handles are placed above the point of greatest diameter, sometimes quite close to the neck (Fig. 50a).

The dimensions of the extremes of the present series are: diameter $6\frac{1}{4}$ inches, height 5 inches, height of neck $1\frac{1}{4}$ inches, diameter of neck, 1 inch (Fig. 50a); and diameter 11 inches, height $8\frac{1}{4}$ inches, diameter of neck, 3 inches, height of neck, $2\frac{1}{2}$ inches (Fig. 49a). The curve of certain fragments indicates that water jars of at least twice the capacity of the largest here cited were not uncommon.

One pitcher is of the Pueblo Bonito type, while the other three are of a form characteristic of the Aztec Region. The Pueblo Bonito pitchers have bowl-shaped bases, from the rim of which a shoulder slopes abruptly inward, and connects with the lower edge of a tall, cylindrical, or slightly tapering neck. Both ends of the vertical band handle normally are attached to the neck.

Globular bodies, with relatively narrow, short, straight necks, characterize the Aztec type of pitchers.

The Bonito type of pitcher is larger than the average— $8\frac{1}{4}$ inches high (Fig. 50b). Pitchers of the Aztec type range in height from $4\frac{1}{4}$ inches (Fig. 50c), to $5\frac{1}{4}$ inches. With the latter type one end of the handle is attached to the base, the other to the neck.

The collection contains thirteen mugs with flat bottoms. From the disk-like bottoms the vessel walls rise perpendicularly or are inclined inward, sometimes with a slight curve. Fig. 51 illustrates a representative series. In height, the mugs vary from $2\frac{1}{16}$ inches to $4\frac{1}{4}$ inches. One specimen has a T-shaped opening in the handle (Fig. 51e). Mugs with flat bottoms, globular bodies and recurved rims are not common, there being only one in the collection, Fig. 52.

Dippers or ladles were fitted with many different types of handles. The present collection contains seven with entire handles. Six of these have tubular handles; the seventh a flat solid handle, roughly rectangular in cross-section. In length the dippers range from $5\frac{1}{2}$ inches—diameter of bowl $2\frac{3}{8}$ inches, length of handle $3\frac{3}{8}$ inches (Fig. 53b) to $12\frac{1}{4}$ inches—diameter of bowl 5 inches, length of handle $7\frac{3}{4}$ inches (Fig. 53a). Normally, tubular dipper handles were moulded over sticks, and invariably in such cases a perforation was left either at the end or along the side to allow for the escape of gas when the stick was consumed in the firing of the vessel. One tubular handle encloses a pebble or pellet of clay which rattles when the handle is shaken.

Solid handles are rarely cylindrical. Many are flat, some of them with large eyes near the end by which to suspend the dippers. Occasionally three cylinders of clay were placed side by side to form a flat tripartate handle.

Loop handles, though rare, have been observed among the fragments. One or two transverse partitions serve to strengthen the thin sides of the loop.

"Half-gourd" ladles have not been found entire. However, a few fragments of the concave handles of this type have come from what appear to be relatively old refuse deposits.

Three bird-form vessels are shown in Fig. 54. Fragments of two more have been observed among potsherds from refuse piles.

Fig. 54b has a globular body $4\frac{3}{8}$ inches in diameter, with a circular opening $2\frac{1}{16}$ inches in diameter in the top. A bird head in relief rises from the sloping side between the opening and the girdle of the vessel. Fig. 54a consists of a triangular body 6 inches long with a stubby tail at the apex, and a diminutive head in relief at the center of the base. In the top there is a T-shaped opening $3\frac{3}{16}$ inches long, placed well toward the forward end. In Fig. 54c the topography of a turtle-dove is delineated with such skill that a single glance suffices to establish the identity of the bird. There is a T-shaped opening $1\frac{1}{4}$ inches long in the back just to the rear of the head. The length of the vessel is 6 inches.

Two potsherds exemplify the attainment of an ornamental effect by an unusual modification of technique consisting of the application of blunt conical spines to the exterior surfaces of vessels. One fragment is from a crude pot, $3\frac{1}{2}$ inches in height, shaped like an egg resting upon the larger end, with the smaller end truncated and surmounted by a short recurved rim. The spines are arranged in lines running obliquely to the right from the base of the vessel to the lower edge of the rim.

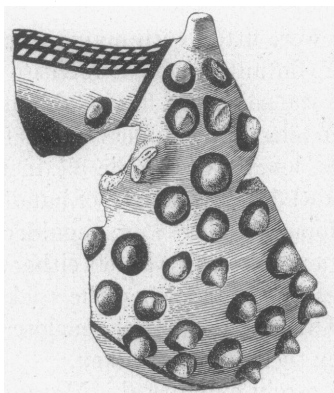


Fig. 55 (29.0-8088). Black-on-white Potsherd with Spine-like Ornamentation. From room of ruin, leveled by Mr. H. D. Abrams, about 150 yards north from northeast corner of the Aztec Ruin.

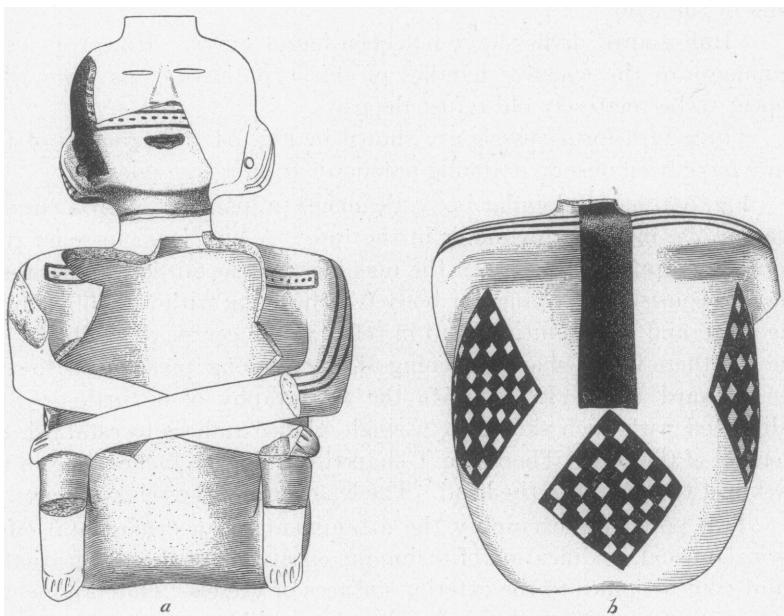


Fig. 56 *a* (29.0-6991, 7321), *b* (29.0-7321). Black-on-white Human Effigy, Restored in Outline. *a* front, from Room 54, East Wing; head, from Room 47, East Wing; *b*, back.

The second fragmentary vessel appears to have been an animal effigy of excellent workmanship (Fig. 55). A transverse zone comprising the neck region and the back of the head is thickly studded with the conical spines, each surrounded by a black line, and tipped with black. Ornamentation of this character is, to say the least, unusual in the Pueblo Area.

Fragments representative of at least six human effigies have been found within the walls of the Aztec Ruin. Of these, the most complete, restored in outline, is shown in Fig. 56. The figure is that of an individual in a sitting position with arms crossed and hands resting upon the elevated knees. Although the trunk is squat and thick and the appendages are not in true proportion, the modeling is reasonably well done.

Painted ornamentation occurs on several parts of the figure. A row of black dots, bordered above and below with black lines, crosses the face between the nose and the mouth. At the right side these transverse lines connect with a black area covering the side of the face from the cheek to the ear and from the bottom of the ear upward past the temple. Presumably, the same plan was carried out on the missing left side. The ear is pierced just below the center. All that remains of the area back of the ear is black, except for a keg-shaped elevation, probably intended to represent a roll of hair, which extends backward at an angle of about forty degrees from a point just to the rear of the lower tip of the ear. The ends of the hair-roll are black also, and the roll is crossed by four narrow bands of black.

Black lines have encircled the neck. One is plainly discernible and there is a portion of another. A broad black band runs from the broken edge of the neck a trifle more than halfway down the center of the back (Fig. 56b). Three black lines extend at right angles from this band along the shoulders and down the upper surface of the arms. A large diamond-shaped pattern, composed of white squares upon a black ground, fills the portion of the back below the end of the vertical band.

On either side of the black band there is a similar though somewhat larger diamond covering most of the space between the shoulder line, and the middle of the back.

While the genital organs do not appear upon this figure, to judge from the form of the hair dress it was intended to represent a female.

Animal forms are not infrequent. The miniature effigy appearing in Fig. 57 is that of a skunk. Notwithstanding the crude modeling, the

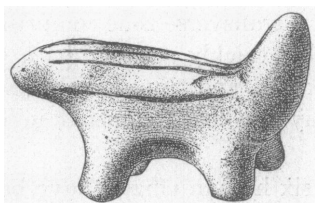


Fig. 57 (29.0-7523). Black-on-white Effigy of a Skunk. From Room 48, East Wing.

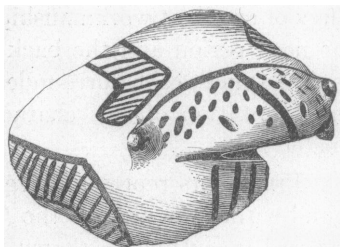


Fig. 58 (29.0-6996). Portion of Black-on-white Frog Effigy. From Room 47, East Wing.

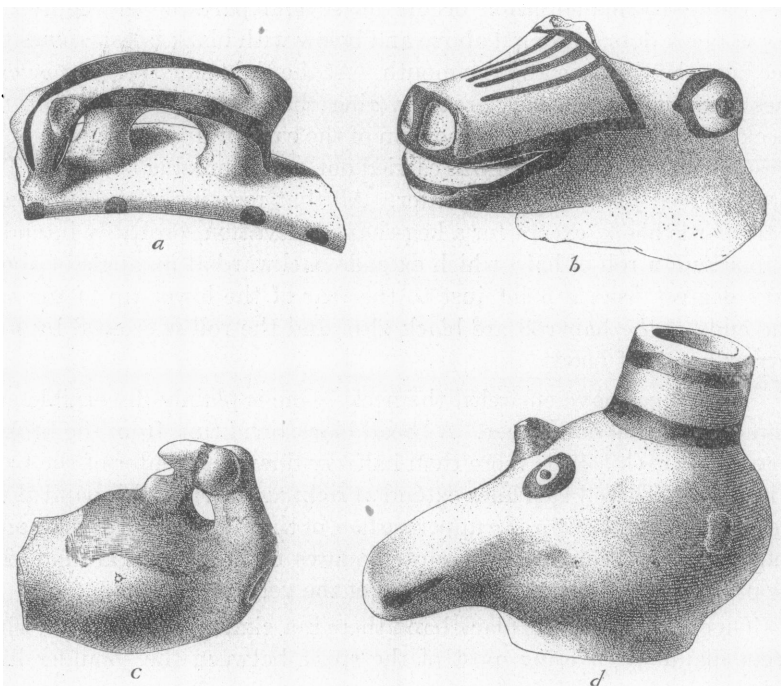


Fig. 59 *a* (29.0-7187), *b* (29.0-8014), *c* (29.0-5423), *d* (29.0-6892). Animal Effigies. *a*, animal handle on black-on-white bowl, Room 52, East Wing; *b*, head of black-on-white animal effigy, Kiva I, North Wing; *c*, black-on-white parrot head, Court; *d*, head of black-on-white bird effigy, Room 37, East Wing.

elongated head, the large tail, and the black lines down the back establish the identity of the animal.

Fig. 59a illustrates an animal figure attached to the side of a bowl to serve as a handle.

The head of a deer-like creature is shown in Fig. 59b. A notable feature of this fragment is that the eye is in relief.

A portion of a frog effigy is shown in Fig. 58. The eyes are in relief, the nostrils are incised, and the mouth is a slit, accentuated by a black line drawn through the slit and extending beyond it at the ends.

Except for the bird-form vessels, previously described, only two clay representations of birds have been found. One presumably is the end of a dipper handle (Fig. 59c), evidently intended to represent the head of a parrot. The other (Fig. 59d), a portion of an effigy vessel, seems to be the head of a goose with a distorted bill.

Painted Decoration of Pottery. A detailed treatment of pottery designs cannot be included in this paper. However, it may of value to give a brief outline of the general plans in conformity with which patterns were applied to the surfaces of different forms of vessels, and to mention the more common and characteristic elements of which the designs were compounded. Only black-on-white pottery will be considered, since there is not at hand a sufficient series of redware and its variants to offer a satisfactory basis for generalization.

A bowl presents to the eye of the decorator three surfaces susceptible of ornamentation: the concave interior; the convex exterior; and the narrow more or less flat surface of the rim. The decoration of these three surfaces will be considered in the order of their relative importance.

I. Interior decoration. Two types of designs were used in decorating the interiors of bowls. A design of the first type may be considered composite, that is, made up of repetitions of the same element, while a design of the second type, although composed of several elements, is in its entirety one decorative unit. Because of the portions of the field decorated with each of these types of patterns, the first will be called zonal ornamentation, the second entire ornamentation.

A. Zonal ornamentation. This type of design consists of a relatively broad zone of ornamentation encircling the bowl, covering approximately the peripheral three-fifths of the concave field. There are several varieties of zonal decoration.

1. The most simple zonal ornamentation consists in each case of a series of from nine to fifteen concentric lines. Both upper and lower bounding lines are heavier than the others, and hence appear as a border to the design. Of a series of 105 bowls, eight bear this type of ornamentation (Fig. 60a).

2. In six cases the zone of ornamentation consists of a repetition of the same element, without a border above and below (Fig. 60b).
3. The most prevalent ornamentation is composed of a central zone consisting of a repetition of the same element, set off above and below by borders of one or more parallel lines (Fig. 61a). If there is only one border line, the line is relatively broad and heavy. If there are several, the outer, or bounding lines are much broader than the rest. Seventy-three bowls bear decoration of this type.

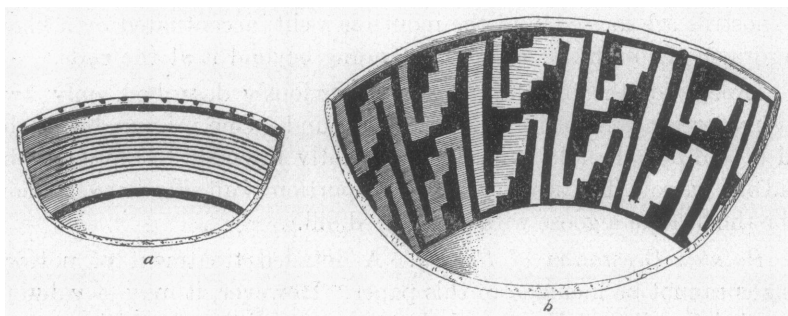


Fig. 60 *a* (29.0-7902), *b* (29.0-6982). First and Second Types of Zonal Ornamentation of Bowl Interiors. *a*, from Grave 16, Room 41, East Wing; *b*, from Room 47, North Wing.

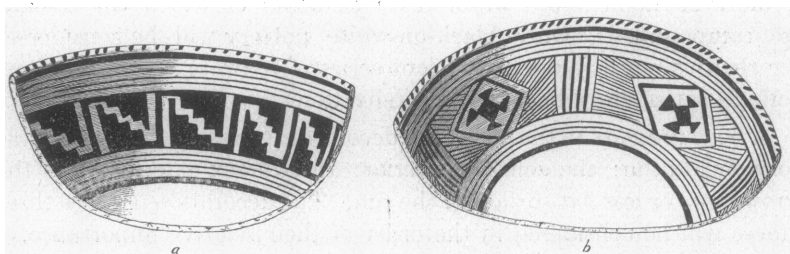


Fig. 61 *a* (29.0-7439), *b* (29.0-6889). Third and Fourth Types of Zonal Ornamentation of Bowl Interiors. *a*, from top level, Room 64, North Wing; *b*, from Room 37, East Wing.

4. In the fourth variety of zonal ornamentation, the decorated zone is divided into four panels by series of vertical parallel line (Fig. 61b). Of the four examples of this type two have borders of parallel lines, and two are without borders.
- B. "Entire" ornamentation. Where this type of design was used, the entire interior of the bowl was taken as a field for the application of one decorative device. There are six varieties of "entire" ornamentation.
1. What seems to be the most simple variety of entire ornamentation rests upon the principle of lateral symmetry. A heavy line crossing the center of the bowl gives an axis for the design, like elements filling the areas on either side (Fig. 62a). There are two examples of this type.

2. There are three bowls bearing "entire" designs based upon the triangle (Fig. 62b). A triangle with arms extending from the apices to the periphery of the bowl is the central element. After reaching the rim of the bowl, the arms run for a distance to the right parallel with the rim, then end in "spiral triangles." Additional elements, both hachured and solid, were introduced to cover the part of the ground not occupied by the main element.

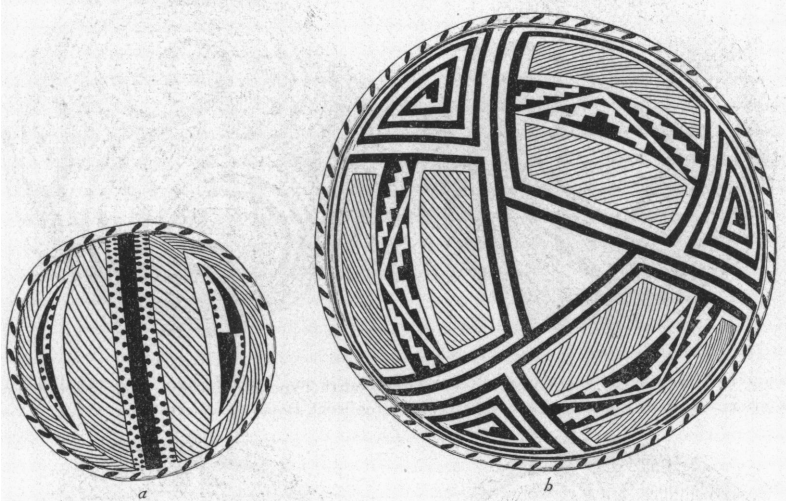


Fig. 62 *a* (29.0-7852), *b* (29.0-6882). First and Second Types of "Entire" Decoration of Bowl Interiors. *a*, from Grave 15, Room 56, East Wing; *b*, from Grave 10, Room 37, East Wing.

3. In three cases the basic element is a square. Arms extend outward a certain distance from the corners then turn at right angles, like the arms of a swastika. As with the triangle patterns, hachured and solid elements fill the rest of the field. In one case the arms of the square were changed to spirals. (Fig. 63a).
4. A single scroll is the basic element of the decoration of three bowls. The pattern shown in Fig. 63b is typical.
5. There are two examples of designs based upon the double scroll. Fig. 64a illustrates this sort of decoration, and should serve in lieu of further description.
6. Interlocking spirals are the central element of the decoration of the bowl shown in Fig. 64b.

II. Exterior decoration. Seventy-three of the series of 105 bowls have some form of exterior ornamentation. Since the black-on-white bowls of many localities are never decorated on the exterior, and since the same seems to hold for the previously mentioned archaic type at Aztec, this relative profusion of exterior ornamentation certainly has some significance. It may be only a localized trait, but more probably it is a feature characteristic of very late black-on-white time.

- A. Zonal ornamentation is also the most prevalent type of exterior decoration, but the absence of border lines is more marked. Forty-two bowls are encircled with a zone of ornamentation made up of a repetition of the same element like the second variety of zonal interior decoration, while only eleven have the zone of ornamentation with one border line above and below.

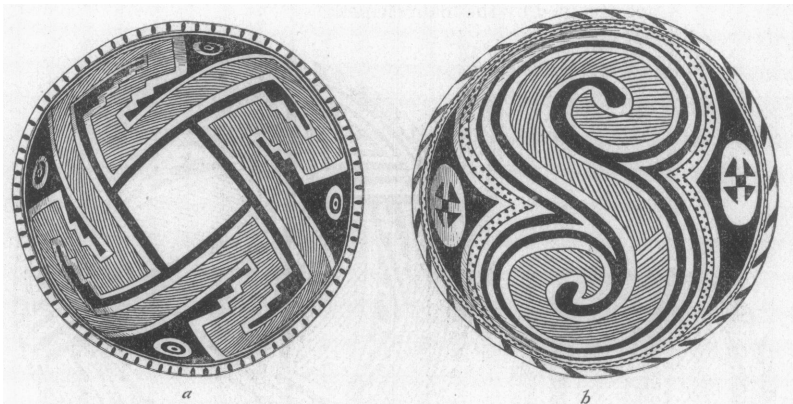


Fig. 63 *a* (29.0-7183), *b* (29.0-7424). Third and Fourth Types of "Entire" Decoration of Bowl Interiors. *a*, from Room 52, East Wing; *b*, from top level, Room 65, North Wing.

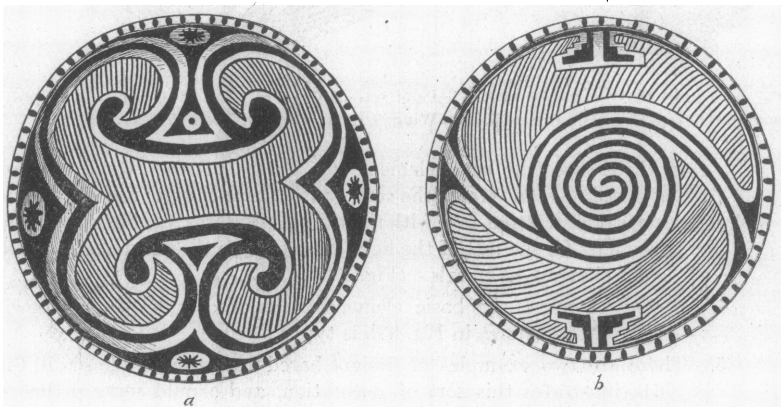


Fig. 64 *a* (29.0-7426), *b* (29.0-7897). Fifth and Sixth Types of "Entire" Decoration of Bowl Interiors. *a*, from top level, Room 65, North Wing; *b*, from Grave 16, Room 41, East Wing.

- B. The remaining twenty exterior patterns are not continuous. Two bowls are encircled by a row of "turkey track" patterns, another by a row of crosses, and one by a row of spirals. Seven bear four ornamental panels equally spaced; one, six panels; four, two panels; two, three panels. One bowl has three spirals equally spaced, and the last has two hourglass figures, diagonally placed on one side. "Entire" decoration was never applied to the exteriors of bowls.



Fig. 65 (29.0-6882, 6896, 7886, 7882, 7897, 7892). Black-on-white Bowls, Normal Type. *a*, from Grave 10, Room 37, East Wing; *b*, from Room 44, East Wing; *c*, *d*, *e*, *f*, from Grave 16, Room 41, East Wing.

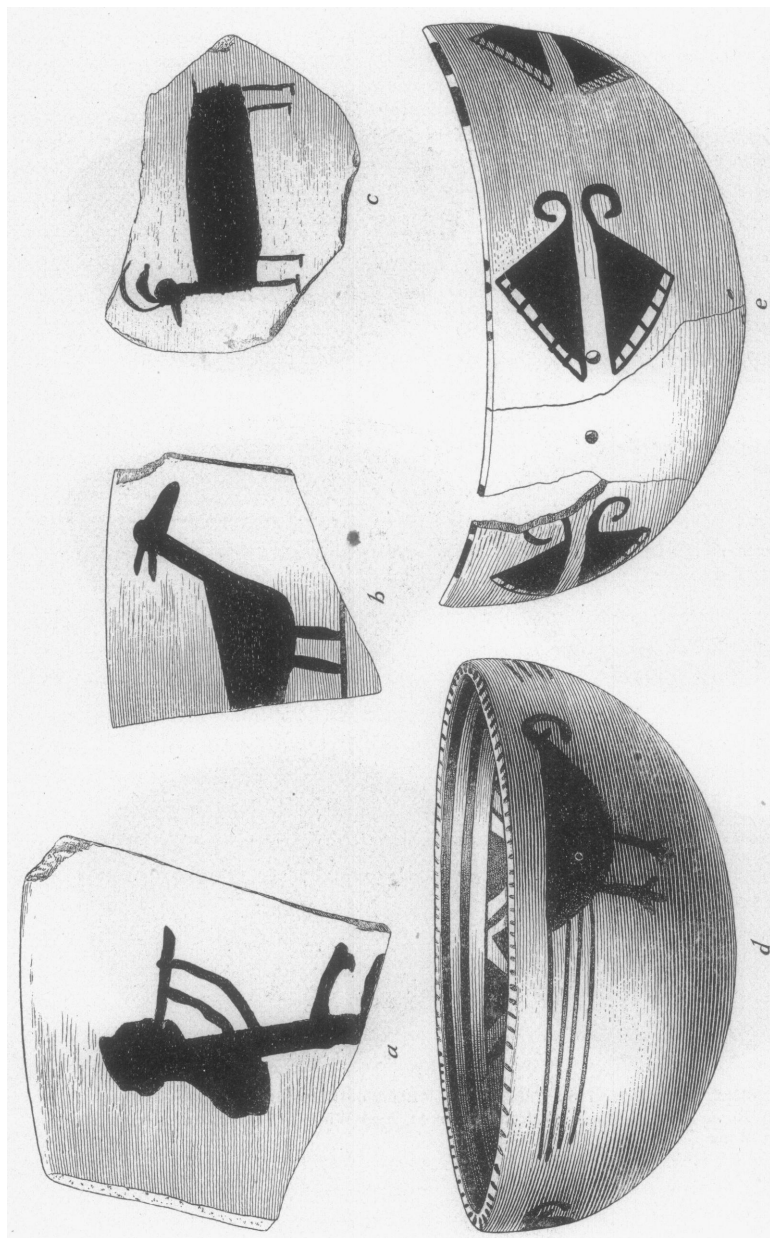


Fig. 66 *a* (29.0-7083), *c* (29.0-7089), *d* (29.0-7896), *e* (29.0-7442). Black-on-white Pottery with Drawings of Animal, Bird, and Human Forms. *a*, potsherd with drawing of human form, Room 45, East Wing; *b*, potsherd with drawing of deer; *c*, potsherd with drawing of mammal form, Room 50, East Wing; *d*, bowl with drawing of bird forms, Grave 16, Room 41, East Wing; *e*, fragmentary bowl with drawings of butterfly, top level, Room 64, North Wing.

III. Rim decoration. Of 105 bowls; six rims are plain; three are black; seventy are continuously dotted; five have four series of dots, with plain spaces between; two have six series of dots, with plain spaces between; two have seven series of dots with plain spaces between; seven are decorated with oblique lines; seven are decorated with zigzag lines; one has three series of dots, alternating with areas bearing zigzag lines; two have four series of dots alternating with black lozenge-shaped areas.

Globular bowls, vessels with rim and flange, and water jars are classed together because of their similarity of form. The upper half of the exterior surfaces of such vessels bears painted ornamentation. The treatment of the field is much the same as for bowl interiors, except that the designs are conformed to a convex instead of a concave surface. Decorative zones, consisting of a repeated element with a border of lines above and below (third variety of zonal ornamentation for bowls) and "entire" designs based upon the square (third type of "entire" decoration for bowls) are the only decorative devices observed on globular vessels.

The exterior surfaces of pitchers are separated into two fields for the application of painted designs. One encircling zone of ornamentation was applied to the inward slope of the base of a pitcher, and another zone, usually a repetition of that appearing upon the base, to the cylindrical neck.

Either one or two zones of ornamentation appear upon the exteriors of mugs. The zones have borders of one or more parallel lines, that is, they are essentially the same as the third variety of zonal bowl decoration.

Zonal and "entire" ornamentation both were used to decorate the concave surfaces of dipper bowls, instances of the former being more numerous. Infrequently the exteriors were encircled with zigzag lines, or daubed with a few splotches of black. Normally the exteriors are plain, the rims dotted. The handles are usually decorated upon their upper surfaces.

Design Elements. Geometric designs predominate almost to the exclusion of other types, upon pottery from the Aztec Ruin. Among approximately two hundred complete vessels, only one bears a realistic pattern—the bird design shown in Fig. 66d. The other realistic patterns mentioned under a separate heading are from potsherds.

The geometric patterns are again chiefly rectilinear. Upon this basis of classification, of a series of 140 vessels, there are fifteen instances of curvilinear ornamentation and 125 of the rectilinear.

Most conspicuous of the basic elements of rectilinear patterns are the triangle, the terrace, the meander, and square. The dominant elements of curvilinear patterns are the volute, the scroll, and the double scroll.

Life Patterns. One crudely finished fragmentary bowl has a series of human figures encircling the interior. The color of the bowl is a slaty gray. The figures are drawn with a brownish black pigment. The representations of the human form are crudely drawn, yet they are distinctly recognizable. One (Fig. 66a), is that of an individual either hump-backed or carrying a pack and playing upon a flageolet.

Occasionally drawings of mammals were applied both as interior and exterior ornamentation to the surface of bowls. In most cases the identity of the animal represented is difficult to determine. Fig. 66c is an instance of this. While the body and the four legs are certainly those of a mammal, the head, beak, and feather-like attachment above, are more like those of a bird. Occasionally, as in Fig. 66b, the similarity to some animal of the region is quite marked, this drawing doubtless being of a deer.

Bird forms although not common are occasionally found. Fig. 66d is a typical example. Invariably the bird forms have been either carelessly drawn or conventionalized sufficiently to obscure the identity of the bird it was intended to represent.

One crude drawing of a horned toad occurring in the bottom of a bowl is the only reptile form which has been observed.

One fragmentary bowl has a series of butterfly designs constituting an exterior border (Fig. 66e). This design has been observed in other localities in the Animas Valley. In addition to the butterfly pattern, one drawing of a dragonfly and one of a centipede are the only known representations of insects.

Pottery Mending. A surprising number of vessels were repaired after having been broken. Holes were drilled on both sides of the line of fracture, and the edges bound together with cords. Several specimens retain the original binding of yucca. Where the crack extends only a short distance downward from the rim of a bowl, one lashing sufficed to draw it together, but where an entire segment had been broken away, three or sometimes four lashings were used to join the parts.

BEADS AND ORNAMENTS.

Shell. Formidable mountain and desert barriers hundreds of miles in extent isolate the Animas Valley from both the Gulf of Mexico and the California coasts. But in spite of the great difficulty of obtaining them, a surprising number and variety of marine and brackish water shells were worn as objects of personal adornment by the Pueblo aborigines.

At least nine genera are represented. Two are unrecognizable, because only worked sections of the shells have been found and wear has so obliterated the diagnostic features of others that specific determinations cannot be made. Mr. Roy W. Miner of the Museum staff made the following identifications:—

1. *Olivella volutella*. Lam..... Pacific.
2. *Conus* sp..... Gulf of Mexico or Pacific.
3. *Haliotus* sp..... Pacific.
4. *Pectunculus* sp..... Pacific.
5. *Turritella* sp.
6. *Cerithidea sacrata*. Gould..... Pacific.
7. *Trivia solandri*. Gray..... Pacific.

The genera are listed not in proper zoological order, but in accordance with the relative numbers of each which have been found, *Olivella* being most numerous, and *Trivia* least so.

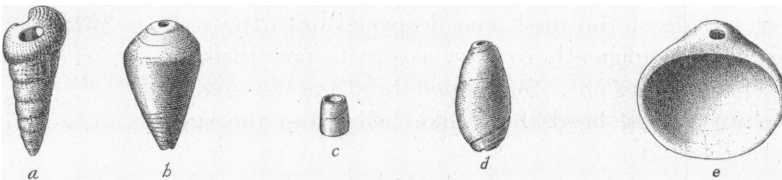


Fig. 67 a (29.0-8079), b (29.0-7987), c ((29.0-6821, d (29.0-7927), e (29.0-7931). Shell Beads, a, *Cerithidea*, northeast corner Room west of Room 6, South Wing; b, *Conus*, Grave 16, Room 41, East Wing; c, *Olivella*, truncated, Room 42, East Wing; d, *Olivella*, Grave 16, Room 41, East Wing; e, *Pectunculus*, Grave 16, Room 41, East Wing.

Because of their suitable shape and size, olivella shells needed little artificial modification to transform them into beads. Usually the tip of the spire was ground off until the end of the cavity was revealed sufficiently to permit the shell to be strung longitudinally upon a cord (Fig. 67d). Two four-strand necklaces, each about twenty feet long when extended, and composed of four hundred olivella shells, were found around the necks of skeletons in Room 41. There was also a four-strand anklet upon the left leg of one of these bodies. Short strands were found with other graves, and detached beads are fairly numerous in refuse deposits.

Occasionally, small olivella shells were truncated; that is, both tapering ends were removed, leaving the central portion of each shell to constitute a keg-shaped bead (Fig. 67c).

Slender conical shells of *Turritella* and *Cerithidea* were worn entire, each one fitted for suspension by a small perforation through the basal whorl, a short distance back from the lip of the orifice (Fig. 67a). So few

of these have been found that it seems they were not worn in numbers as necklaces, but were strung at intervals upon strands of beads of other kinds.

The present collection contains one specimen of *Trinia*. This has two perforations, one on each of the sloping sides of the shell, in the line of the transverse axis.

Conus shells were occasionally, but rarely, worn entire (Fig. 67b). When such was the case the tip of the spire was ground off in order to make possible a longitudinal stringing such as has been described for beads of olivella shell.

Customarily, the spire of each shell was ground away, until the point of greatest diameter was reached. The remaining conical body whorl was perforated near the apex. A short distance back from the lip of the orifice, a transverse groove was cut across the curving side of the shell, and deepened until the wall was pierced sufficiently to allow a cord to pass through the opening (Fig. 68). Suspended thus from the smaller extremity, these beads hung like bells from the supporting strand.



Fig. 68 (29.0-7482).
Bead of *Conus* Shell.
From lower level,
Room 65, North
Wing.

The concavo-convex shells of *Pectunculus* were worn entire, hung from the dorsal edge. The perforation was attained by grinding off the the tip of the hollow beak of each shell (Fig. 67e).

Because of their size and rather ponderous bulk abalone shell (*Haliotis* sp.) were not suitable to be worn whole as ornaments, but they were cut up and fashioned into variously shaped beads and pendants. The more definite and conspicuous forms of abalone shell ornaments may be listed as follows:—

1. Disk-shaped pendants.
2. Oval pendants.
3. Oval beads.
4. Triangular beads.
5. Rectangular beads.
6. Rectangular beads, backed with bone.

The edges of both pendants and beads were smoothly dressed and polished. Disk-shaped pendants vary from $1\frac{1}{2}$ to $2\frac{1}{4}$ inches in diameter, and the oval ones from $2\frac{3}{4}$ to $4\frac{1}{4}$ inches in length. Of some twenty specimens, two pendants have two drill holes for suspension, the other eighteen, one drill hole each.

Oval and rectangular beads were perforated near one extremity, and triangular ones in the center.

Due to its laminated structure abalone shell readily separates into very thin fragile scales. This lack of cohesion between the layers made the manufacture of ornaments from thin sections impractical under ordinary conditions, because pressure or a slight blow, would have broken them to bits. The supply of shell was conserved and its structural defects overcome by an ingenious method. A piece of bone was ground down until it had the proportions of a flat slab, exactly the size of the section of split shell which it was desired to mount. A deep groove was cut across the center of one face, usually longitudinally, but sometimes transversely. Then the rectangle of shell was firmly cemented with gum to the grooved side of the rectangle of bone, which formed a stable backing for the shell, and protected it from blows or pressure. The finished ornament was worn as a bead by threading a cord through the enclosed groove, which with its shell covering, became the homologue of the drill holes in one-piece beads. Fig. 25 shows (a) a complete bead of this character; (b), the grooved bone backing; and (c) the reverse side of the section of shell.

Ornaments of massive shell may be classified as follows:—

1. Irregular pieces of the hinge line, or the crenulated ventral edge, with cut edges smoothed. Perforated for suspension.
2. Slender, curved, tusk-shaped pendants. One end pierced for suspension. Length, $1\frac{1}{2}$ to 3 inches.
3. Long crescent-shaped sections of very thick shell, oval in cross-section. Length 3 inches. Specimens incomplete. Probably suspended at center.
4. "Dummy" or double beads. Shaped like figure eight, one end solid, the other perforated.
5. Small thin disk-shaped beads, $\frac{1}{8}$ to $\frac{5}{16}$ inch diameter.
6. Shell bracelet.
7. Inlay fragments.
8. Shell disks, the backings for mosaics.

The last three are mentioned here only to complete the list. They will be discussed more in detail under the heading of Inlay.

Gilsonite. Gilsonite is a substance closely resembling jet. It is intensely black, light, tough, and susceptible of a very high polish. Chemically, it is a hydrocarbon similar to asphaltum. It occurs in small quantities in sandstone strata some miles southwest of Aztec.

Gilsonite ornaments fall into the following classes:—

1. Rectangular pendants.
2. Trapezoidal pendants.
3. Disk-shaped beads.
4. Frog effigies.
5. Sections for inlaying.

From the fact that rectangular gilsonite pendants have been found most frequently in pairs, it may be inferred that they were worn chiefly as ear ornaments. Width $\frac{1}{2}$ inch, length $\frac{3}{4}$ inch, thickness $\frac{1}{8}$ inch are the dimensions of an average specimen.

Some trapezoidal pendants may also have been ear ornaments, but others are so large that they must have been worn upon the breast. The dimensions of the pendant shown in Fig. 69 are: width of base, $1\frac{5}{16}$ inches; height, $2\frac{5}{16}$ inches; thickness, $1\frac{1}{32}$ inch.

Disk-shaped gilsonite beads average $\frac{1}{4}$ inch in diameter. The edges are not square-cut, that is, are not at right angles to the flat surfaces of the beads but slope slightly inward in both directions from the center.

One fragmentary slab $1\frac{3}{4}$ inches wide and of undetermined length, bears two legs and part of the body of a frog carved in low relief upon its flatter surface. About forty small gilsonite frogs, ranging in length from $\frac{1}{32}$ inch to $\frac{1}{16}$ inch were among the mass of ornaments upon the breast of one of the skeletons in Room 41. These are oval when seen from above (Fig. 70). The eyes, consisting of two raised knobs, are placed nearer one end of the bead than the other. In some cases the eyes are of the same material as the body, in fact are merely parts of the same block left in relief, but in others they are bits of turquoise set with gum in pits drilled into the gilsonite body.

A few of these frog effigies are relatively thick in proportion to their length, with rounded ventral surfaces. In such cases the perforation by which they are strung is a drill hole passing transversely through the body just forward the eyes, as shown in Fig. 70.

The majority, however, are relatively thin, and flat upon the nether surface, each with a transverse groove in the position of the drill hole which traverses the thicker specimens. These were treated in the same way as the rectangular slabs of split abalone shell previously described; that is, each one was cemented to a bone backing. The exposed surfaces of the backings were shaped so that these composite frogs had the same contour as those made from a solid piece of gilsonite.

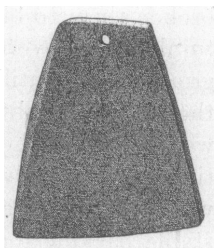


Fig. 69 (29.0-7294).
Gilsonite Pendant.
From Room 49, East
Wing.



Fig. 70 (29.0-7973). Gilsonite
Frog Effigy. From
Grave 16, Room
41, East Wing.

Turquoise. Turquoise is not native in the Aztec Region and presumably was secured from the Rio Grande Valley. Upon the basis of form, the following classes of turquoise ornaments may be recognized.

1. Irregular pendants, rectangular in cross-section. Maximum length, $1\frac{1}{32}$ inch.
2. Oval pendants. Maximum length, $\frac{5}{8}$ inch.
3. Spherical pendants. Maximum diameter $\frac{5}{8}$ inch.
4. Spherical pendants, each with a stem perforated for suspension. Maximum diameter, $\frac{5}{8}$ inch.
5. Irregular small beads, rectangular in cross-section.
6. Disk-shaped beads $\frac{3}{32}$ inch to $\frac{1}{2}$ inch diameter.
7. Tubular beads, $\frac{5}{16}$ inch in diameter, $\frac{3}{8}$ inch in length.
8. Frog effigies.
9. Sections of inlay.

In general, turquoise ornaments reveal excellent workmanship, all surfaces being thoroughly smoothed and polished. In size and technique of manufacture, turquoise frog effigies are identical with those of gilsonite. Some are solid; others are backed with bone.

Selenite. Seams filled with selenite or crystallized gypsum, traverse the clay strata of many hills in the Aztec vicinity. Selenite is soft, white, translucent, or if quite free from impurities, transparent. It readily separates into thin flat flakes. Occasionally, suitable flakes were fashioned into breast or ear ornaments by grinding the edges until the desired form was attained. Pendants of selenite are of four types:—

1. Heart-shaped.
2. Oval.
3. Rectangular.
4. Irregular (fragmentary).

Of a series of eight, two have two perforations for suspension, the other six, one perforation each. The minimum and maximum dimensions are: length, $\frac{1}{16}$ inch; breadth, $\frac{1}{2}$ inch; thickness, $\frac{1}{32}$ inch; and length, $2\frac{7}{8}$ inches; breadth, $1\frac{1}{2}$ inches, thickness, $\frac{3}{16}$ inch.

Calcite. A few tubular beads are the only calcite ornaments found thus far. These average $\frac{5}{16}$ inch in diameter and vary in length from $\frac{5}{16}$ inch to $\frac{1}{16}$ inch.

Quartz Crystals. Six small slender quartz crystals were found together in a refuse deposit. One of them was suspended as a bead or charm by means of a cotton cord bound to one end of the crystal with a wrapping of sinew.

Beaver Incisors. At least one complicated ornament was made from beaver incisors. Sections $1\frac{1}{4}$ inches long were cut from the forward ends of four tusks. Transverse perforations were drilled through each section,

one near either extremity. The tusks were then strung side by side upon cores and cemented together with a backing of gum. Worn as a pendant, the ornament hung with the cutting ends of the tusks downward, presenting a longitudinally ribbed convex surface comparable in appearance to the exterior view of the four fingers of a half-closed hand. The upper end of each red-brown tusk was recessed and set with a rectangle of turquoise.

Walnut Shell Beads or Charms. Walnut shells seem to have been worn as beads or charms. No species of walnut is now native to the Aztec Region, and there is nothing to indicate that there have been changes in flora since the period of Pueblo occupation. Presumably, these nuts were brought from southwestern New Mexico or Arizona where they are said to grow at the present time. Because they were of foreign origin, they may have been valued only as ornaments, but it is more likely that their strangeness caused the mind of the Indian to endow them with mystic powers which made them precious as charms or amulets.

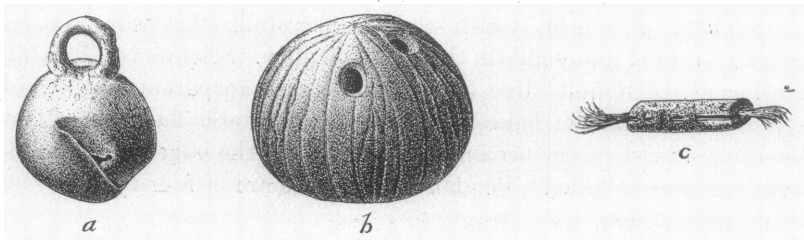


Fig. 71 *a* (29.0-7449), *b* (29.0-7570), *c* (29.0-7457). Copper Bell, Walnut Shell Bead or Charm, and Copper Bead. *a*, from top level, Room 64, North Wing; *b*, Room 48, from East Wing; *c*, from Kiva G.

Two holes were drilled near the blossom end of each nut so that it might be strung on a cord (Fig. 71*b*).

Several very small walnuts, badly charred, were taken from a mug found with the bodies in Room 41. The bases of the nuts have been ground away sufficiently to reveal the four compartments of each shell.

Stone. Beads were manufactured from several kinds of stone. Many specimens have been so thoroughly charred that it is doubtful if chemical analysis and detailed microscopic examination could establish the identity of the original materials. The definite petrological appellations for those materials which have not been changed by fire could be given only as a result of thorough determinations to which it is not now convenient to subject the specimens. However, gross identifications will be given where possible.

Stone beads are of at least four shapes:—

1. Tubular.
2. Spherical.
3. Flat, square.
4. Disk-shaped.

The spherical beads are few in number and average $\frac{1}{16}$ of an inch in diameter. They are made from a soft, white, banded, semi-translucent stone, containing a considerable proportion of lime.

Tubular beads are of two kinds of stone, one the same as that from which the spherical beads were made, the other, though light in color, is crystalline, siliceous, and very hard. Tubular beads are not numerous. An average specimen measures: diameter, $\frac{3}{8}$ inch; length, $\frac{1}{16}$ inch.

Flat, square beads, also few in number, were fashioned from a compact exceptionally fine-grained pink stone which took a high polish. Some are perforated for suspension at one corner, others near the center of one end. A representative specimen is $\frac{7}{16}$ of an inch square and $\frac{1}{16}$ inch thick.

Disk-shaped stone beads are more numerous than all beads of other shapes and materials combined, the present collection containing some 65,000. In size, they vary from, diameter $\frac{1}{2}$ inch, thickness $\frac{1}{100}$ inch to diameter, $\frac{1}{16}$ inch, thickness $\frac{1}{4}$ inch. The larger disk-shaped beads have been so badly charred that further description of them would be profitless.

Some of the strands of small beads are sufficiently remarkable to merit individual mention. The original cords had decayed, so that it was necessary to sift and wash the specimens from the surrounding soil and to re-string them.

The strand of smallest beads is six feet in length, and is composed of about 3,100 individual specimens. These are of surprisingly uniform size, averaging $\frac{1}{25}$ inch in diameter and $\frac{1}{48}$ inch in thickness. The material is a fine-grained, very hard, glossy black stone resembling an excellent quality of slate.

There were two other strands of beads of the same material, one fifty-seven feet long, composed of about 31,000 specimens averaging $\frac{1}{16}$ inch in diameter, and $\frac{1}{48}$ inch in thickness, the other fifty-six feet long, consisting of about 16,600 specimens which average $\frac{1}{12}$ inch in diameter and $\frac{1}{30}$ inch in thickness.

A fourth strand of beads fifteen feet in length, is made up of some 8,500 disks, $\frac{1}{12}$ inch in diameter, and $\frac{1}{47}$ inch in thickness. These beads

are pink in color, and seem to have been made from a quality of shale which occurs above burned-out coal measures some twenty miles northwest of Aztec.

No phase of Pueblo craftsmanship demanded greater skill and finer motor coördinations than did the successful manufacture of these tiny beads. Few of us today would feel competent to grind the minute disks into shape even with modern tools, but the shaping of the beads was simple when compared with the difficulty of perforating them. Indeed, the boring of the almost microscopic holes, $\frac{1}{60}$ inch or less in diameter, would test the powers of a modern jeweler with his metal drills.

An adequate explanation of the process by which such minute perforations were obtained cannot be given. Metal drills the Pueblo certainly did not have, nor drills of any other rigid substance slender enough for such delicate work. In sufficiently thin sections, both stone and bone would have been too brittle to have been serviceable. Probably a spike of vegetable fiber, perhaps a cactus thorn, was rotated in abrasive sand until the center of each disk was worn through, although if such were the method, there is no objective proof of it.

Copper. Contrary to expectations, manufactured objects of copper have been found in the Aztec Ruin. There is one roughly spherical bell $1\frac{1}{2}$ of an inch in diameter, a part of another, and three copper beads.

In form, the bell is roughly spherical. The contour of the upper hemisphere is unbroken except for the attachment of the ring by which the bell was suspended, while the lower half seems to have been cleft into four parts, comparable to the petals of a flower. After the clapper, a pebble was inserted, the four strips of metal were bent inward and upward to close the bottom portion of the bell (Fig. 71a). There seems to be no reason to doubt that this bell was traded in from Mexico.

To make a bead a rectangular sheet of beaten copper was folded on its longer axis into the form of a U-shaped trough. The trough was then slipped over a cord at the point where it was desired it should remain, and the edges were pressed or beaten together. In cross-section, the resulting ornament was rectangular, with somewhat rounded corners (Fig. 71c), $\frac{1}{16}$ inch is the length of the figured specimen.

Inlay and Mosaics. The component elements of inlaid and mosaic designs are the same, and as far as materials and forms are concerned, might have been used interchangeably. Therefore they will be listed together.

Material	Color	Shape	Function
1. Shell	white	{ rectangular triangular arc-shaped circular (flat) circular (oval in cross-section)	inlay-cf. shell Fig. 72b
2. Shale (burned)	pink		mosaic rings
3. Jasper	red		mosaic rings
4. Galena	lead color (mirror-like)		centers of mosaic disk
5. Turquoise	green, blue		eyes of frogs, etc.
6. Gilsonite	black		

These individual sections are all small, varying from $\frac{1}{8}$ inch long and $\frac{3}{32}$ inch wide to $\frac{1}{2}$ inch long and $\frac{1}{4}$ inch wide. The central disks vary from $\frac{7}{16}$ inch to $\frac{11}{16}$ inch in diameter.

The collection contains the following inlaid objects:—

1. Frog effigies (gilsonite)
2. Bone scrapers
3. Shell bracelet
4. Shell of marine bivalve

Frog effigies and the bone scrapers have been described respectively under the headings, Gilsonite and Bone Implements.

The bracelet is a portion of a thick marine bivalve shell. A ring-like section was severed from the periphery of the valve in a plane parallel with the base of the shell. By long-continued grinding, the

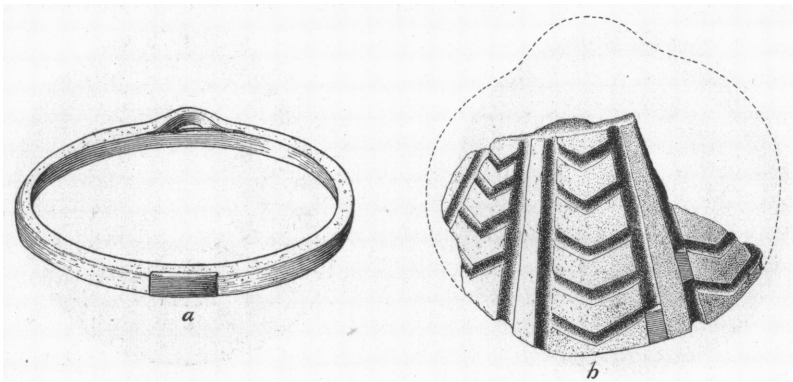


Fig. 72 a (29.0-7002), b (29.0-7951). Shell Bracelet and an Inlaid Shell. a, from Room 47, East Wing; b, from Grave 16, Room 41, East Wing.

irregular surfaces were reduced until the wall of the ring was rectangular in cross-section, slightly higher than wide ($\frac{1}{8}$ inch by $\frac{3}{16}$ inch). The bracelet is $2\frac{1}{4}$ inches in diameter. On what was the dorsal side of the shell, the sectioned beak forms a symmetrical protuberant decoration, while the exterior surface of the opposite side of the bracelet is recessed and set with a rectangle of excellent turquoise $\frac{1}{2}$ inch in length (Fig. 72a).

Although scattered fragments indicate that the application of inlaid ornamentation to the convex surfaces of shells was a fairly common practice, only one specimen has been recovered more or less complete (Fig. 72b). The design should be sufficiently apparent from the illustration to make detailed description unnecessary. Bits of turquoise, set in flush with the shell, presented a bright blue-green pattern against the brilliant white polished surface of the nacre.

The neatly cut grooves average $\frac{3}{32}$ inch in width and $\frac{1}{16}$ inch in depth. The maximum diameter of the shell was about $2\frac{1}{2}$ inches.

Circular pendants are the only mosaic ornaments which have been recovered sufficiently complete to determine the original form. There were some twenty of these on the breast of a skeleton in Room 41. Unfortunately, fire had completely destroyed some of them, and had burned away the cementing matrix of the others so that the bits of mosaic were with few exceptions detached from the backing.

A disk of shell with one side convex was the foundation for each pendant. The mosaic was applied to the convex surface, which was usually terraced for the reception of each of the concentric rings which surrounded the central element of the design. To enable the disk to be suspended without allowing the cord to show upon the decorated side, a

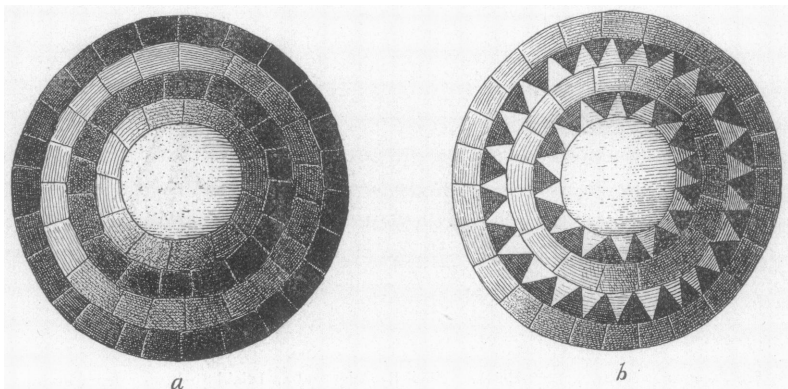


Fig. 73. Mosaic Pendants reconstructed from Fragmentary Specimens.

deep groove was cut across the center of the convex surface of the shell. Two holes were drilled from the rear side of the disk to the extremities of the groove, so that a cord might be inserted through one hole, passed behind the mosaic covering of the groove, and drawn out through the other hole, much as one of our solid topped buttons would be threaded on a cord.

The gross structural plan of arrangement of the mosaic decorations of all pendants was the same; each pattern consists of a central disk surrounded by four concentric rings composed of many rectangular or triangular elements. However, a considerable variation of color schemes was obtained by shifting the relative position of the elements of different materials. This is illustrated by the two pendants appearing in Fig. 73. The central disks of both are of red stone. The first and third concentric rings of *a* are of turquoise; the second and fourth of gilsonite; whereas the first and third rings of *b* are composed of alternating triangles of gilsonite, and bright, mirror-like crystals of galena; the second and fourth rings are of turquoise.

Because of the finding of considerable quantities of detached mosaic fragments, it is probable that the backings of some of the original disks were of leather, wood, or some material of which every trace has perished. Pitch was the cementing material which originally held the mosaics in place. A great many of the fragments were perforated with minute drill holes which subsequently were plugged up and effectually concealed with neatly fitting disks of the same material from which the fragment in question was fashioned. This may be explained by assuming that beads and other ornaments were cut up and put to a secondary use in the manufacture of mosaics, the drill holes having been for the suspension of the original ornaments.

It is a regrettable fact that the mosaics are in such a poor state of preservation. The excellent technique of their manufacture, and their inherent beauty would have merited lengthy description, but because of the fragmentary condition of the specimens at hand, they must be dismissed with only a few brief paragraphs. It is to be hoped that there is still hidden in the unexcavated portion of the Aztec Ruin a wealth of mosaic ornaments, such as was found in Room 41, which has not been ruined by fire and decay.

CULTURAL AND CHRONOLOGICAL POSITION OF THE AZTEC RUIN.

The study of the numerous specimens which have been briefly described in the foregoing pages is amply justifiable because of the clear ray which it casts backward into the shadows which preceded the dawn of history upon our continent. This ray illumines for us in fairly true perspective the material accomplishments of a civilization which had passed its zenith and swung into the descending arc of its existence long before the irruption of Europeans into the Southwest.

But our problem is primarily an historical one and it puts before us questions that cannot be answered unless we consider the facts of material culture as a means to an end, and not an end in themselves.

Considering the various ruins as symbols of complexes of which they are, it must be admitted, but a partial expression, the main desideratum is to determine the cultural relationship of the Aztec Ruin to those of the neighboring areas, and to establish its relative chronological position in the life cycle of Pueblo civilization as a whole.

Inasmuch as the exploration is only partially completed, ultimate conclusions cannot be drawn at the present time, but a few definite statements may be made without too great risk of error. Architecturally the Aztec Ruin must be classed with Pueblo Bonito and the other members of the Chaco Canyon group. The similarity is close throughout. To be sure, there is a marked difference between the outline of the groundplan of the Aztec Ruin and that of Pueblo Bonito, but this difference is no greater than that observable between Pueblo Bonito and Pueblo Chetetrokettle, a component and integral member of the Chaco group. If the preservation of Pueblo Chetetrokettle had been such that it merited exploitation as the outstanding member of the Chaco group, and if it had in consequence become fixed in our minds as such, the similarity between it and the Aztec Ruin would have been readily apparent to the most casual observer, for the groundplans of the two are practically identical, except that Chetetrokettle covers a somewhat more extended area.

Although the main building of Pueblo Bonito is arc-shaped, while that at Aztec forms three sides of a rectangle, the basic concept of the structures is the same. Each rises with sheer outer walls enclosing an open court which was protected from invasion on the south or sunward

side by a low one-storied tier of rooms. The details of construction are the same throughout. The walls are very thick at the bottom, and become progressively thinner with each succeeding story. Joints were seldom broken, and "headers" that is, stones laid with their longer axes at right angles to the faces of a wall, were not used to bind the veneer to the core of the masonry. Where walls intersect, usually one merely butts up against the other, and is seldom tied to it in any fashion. Where exceptions to this rule occur, the ties are seldom of stone and mortar, but consist of rows of sticks or slender poles which cross the line of junction, and have their ends embedded in the masonry on either side.

A better quality of sandstone was available at Bonito than at Aztec; hence, the first-hand impression that Pueblo Bonito is the more skillfully built of the two ruins.

The ceilings of both buildings are high—9½ to 11 feet—and are constructed in the same manner. Large timbers support a transverse layer of smaller poles covered with a thatching of strips of split cedar which in turn is surmounted by a coating of adobe that formed the floor of the room above.

Doorways are rectangular and T-shaped, with the former in predominance. Both types are relatively large, and normally traverse the center of side and end walls. Occasionally, however, in the second story, rectangular doorways pierce intersecting walls at their point of junction, connecting the corners of diagonally adjacent chambers. These diagonal doors are distinctive of Pueblo Bonito architecture, and their presence at Aztec affords one of the strongest justifications for classing the two structures together.

Kivas occur both above and below ground, the former incorporated within the main building mass, the latter beneath the open court. There is no apparent difference in the details of pillars, banquettes, ventilators, etc., to disturb the postulated architectural identity of the two ruins under discussion.

There is also a structural similarity between the great ruin at Aztec, and certain of the aboriginal monuments in the Mesa Verde, notably Far View House and Sun Temple. However, these examples may be regarded as peripheral, for whatever the ultimate point of origin, the hub of this architectural wheel lies in the Chaco Canyon.

Before turning to a discussion of the direct ceramic relationships between the culture of the Animas Valley and that of the neighboring regions, it seems advisable to make a few explanatory statements. Commonly, the wares of the Mesa Verde, of the Chaco Canyon, and of

the Aztec vicinity are each considered a homogenous unit, that is, as if ceramic art of each of the respective areas had remained unchanged throughout the entire period of Pueblo occupation. Such is not the case.

The ruins in the Mesa Verde represent three chronological variants of Pueblo culture, each with its distinctive architectural and ceramic accompaniment.

At Aztec two periods of occupation are fairly evident, and the same may be said for the Chaco Canyon. Superficially, these appear to coincide with the two later periods in the Mesa Verde, and it is the firm belief of the present writer that the third, or more ancient period, will be found to have extended both to the Animas Valley and the Chaco Canyon, when a systematic search for it is undertaken.

Because of the existence of these different periods of Pueblo occupation, each with its characteristic ceramic expression, there must be a delimitation of the wares which have been accepted as most typical of each area. Naturally, the varieties of pottery of which the most numerous specimens have come to light, and been accepted as constituting the ranking types for each locality, have come from the larger, more spectacular ruins which were the first to be exploited. Thus in the accepted terminology *Mesa Verde ware* signifies pottery belonging to the period of the great cliff-dwellings; *Chaco Canyon ware*, that exhumed in Pueblo Bonito and the other large ruins of the group; and *Aztec ware*, the kind of pottery that has been taken from the Aztec Ruin, which does not necessarily include that from the smaller surrounding sites.

About ninety-five percent of the pottery from the Aztec Ruin is identical in every respect with typical Mesa Verde ware. The flat-bottomed mug and the vase with rim and cover-flange are the two diagnostic Mesa Verde forms. These are much in evidence in the collection from Aztec. Other form correlations between the vessels of the two areas are the common presence of small-mouthed water jars with concave bottoms and two loop handles; ladles with tubular handles; and relatively thick-walled bowls with flat rims.

In both places, the same fundamental design units were elaborated into decorative devices, namely, the triangle, the terrace, the meander, and the volute, while in the design complexes, solid elements predominate over hachured.

The remaining five percent of the pottery vessels from Aztec not accounted for above, show that influences from several other directions played a part in moulding the ceramic complex. Vessels from Chaco

Canyon, from the Tularosa Area in southwestern New Mexico, and from the northern Little Colorado Region are readily distinguishable. From the nature of the paste, slip, and general technique, the Chaco Canyon type of vessels found at Aztec, was undoubtedly manufactured by members of the latter community. The case is not so clear in regard to the others. It is probable that the few specimens of Tularosa and Little Colorado ware were importations, but on the other hand, it is not impossible that they represent the handiwork of women, who, having become members of the Aztec group through capture, or by marriage, continued to practise in their new environment the technique which in childhood they learned in the locality whence they came.

The present writer has established a tentative chronological series for the upper San Juan Drainage which may be expected to stand in the light of future research. In this series, three distinct ceramic periods are recognized.

1. Formative (Pre-Pueblo).
2. Early Two-Color Painted Ware (Black-on-White).
3. Late Two-Color Painted Ware (Black-on-White).

For the Rio Grande Valley the chronological ceramic series, worked out with pleasing definiteness and finality by Mr. Nelson and Dr. Kidder, is composed of the following divisions:—

1. Two and Three-Color Painted Ware.
2. Two-Color Glazed Ware.
3. Three-Color Glazed and Painted Ware.
4. Historic Two-Color Glazed Ware.
5. Modern Painted Ware.

These two series overlap, the first Rio Grande period embracing the third period of the upper San Juan series. The significance of this is that Pueblo culture seems to have begun in the canyons north of the San Juan River a considerable length of time before it was introduced into the Rio Grande Valley. Inasmuch as the earliest Rio Grande wares are indubitably related to, and apparently derived from, the latest wares from the region to the northwest, these two series may be thrown together to represent the entire table of ceramic sequence for the northern and eastern Pueblo areas. This complete table is, then, comprised of seven periods:—

1. Formative (Pre-Pueblo).
2. Early Two Color Painted Ware (Black-on-White).
3. Late Two Color Painted Ware (Black-on-White).
4. Two Color Glazed Wares.
5. Three Color Glazed and Painted Ware.
6. Historic Two Color Glazed Ware.
7. Modern Painted Ware.

That phase of Pueblo culture of which the Aztec Ruin is the architectural component flourished and passed into extinction, so far as the Animas Valley is concerned, during the third period, that is, very late in black-on-white ceramic time. It is presumable that extended research will determine that the two hundred or more ruins in the Animas Valley mark an aboriginal occupation which began early in the formative period, and continued practically without a break until the abandonment of the great pueblo at Aztec. However, no more definite statement than the above can be made at the present time.