a small oval mat (plate 22, b); in one case a thin slab of sandstone is used.[1] The crudest were wads of cedar bark or grass. The cores were wrapped and padded with shredded cedar bark, more or less thickly according to their hardness, and were finally enclosed in prairie-dog skin covers prepared as follows (plate 22, a); the complete hide was trimmed by cutting away the feet and tail, and shaped into a long bag with the fur outside. The padded core was placed in the bottom of this, the upper part folded down, and the whole neatly sewed up with sinew or fine fiber thread. There is one specimen (plate 31, a) to which is still attached the narrow human hair string band that formerly held it in place against the abdomen of the infant.

BASKETRY

Coiled Basketry. The Basket-maker culture was so named by the Wetherill brothers because of the abundance of baskets found in the graves. The burials of this people excavated by the Peabody Museum expeditions in Marsh Pass ran true to type in this respect as in all others; and, wherever the cists were protected from moisture and undisturbed by ancient looters, fine specimens were always to be found, while throughout the general digging in the caves fragments of worn-out baskets were encountered in great abundance.

All the specimens recovered were of the coiled variety, no case of twining, checkerwork, or wickerwork having been found; a single twilled example, in reality more like a flexible pouch than a true basket, will be described later. In weave the coiled baskets form a very homogeneous group; they are made over a foundation consisting of two slim osiers laid side by side, with a padding or welt of yucca fiber or shredded roots. The sewing elements are wooden splints averaging a little less than $\frac{1}{8}$ inch wide; they enclose the rods and the fibrous padding bundle and also pass through about half of the bundle of the coil below. It is this gripping of the bundle of the lower coil which alone holds the fabric together, as the stitches of one coil never interlock with those of the coil below them.[2] While the weave is so solid and compact that many of the

[1] For a description of this specimen see Kidder-Guernsey, 1919, p. 192; its use was then unknown to us.

[2] For a diagram of the weave, see Kidder-Guernsey, 1919, figure 80.

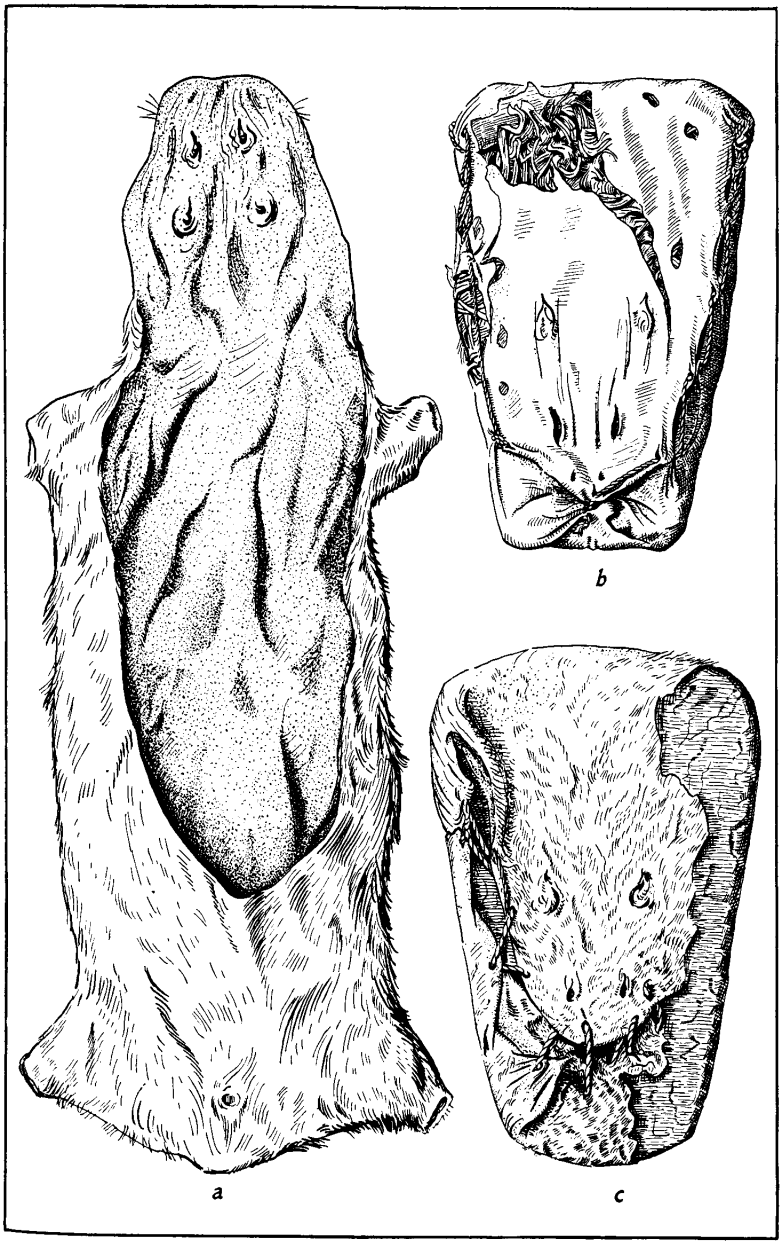
better pieces must have been watertight, it never attains the fineness of texture seen in many California coiled baskets. These ancient weavers strove, apparently, for strength and serviceability rather than for refinement of technic. No more stitches than necessary were used; hence the relatively great width of the individual sewing splints and their broad spacing, which allows the foundation to appear between them. The average tray basket has five coils to the inch and nine to eleven stitches along each inch of coil; the finest specimen has eight coils and twelve stitches; the coarsest, a fragment from a large pannier, has coils ½ inch wide and six to seven stitches to the inch of coil. The edge bindings of all the baskets save one are in simple wrapping; the exception is a bowl-shaped piece (plate 23, i) in which the entire rim is finished in " false-braid " as in Navajo baskets.[1]

Our specimens fall into the following five classes:

1. Trays
2. Bowls
3. Carrying baskets
4. Water baskets
5. Trinket baskets

Trays. This is by far the commonest type. The examples are very flat, and run from 12 to 24 inches in diameter. They were probably used for the serving of food, and perhaps in gambling. One tray (plate 23, j) obviously had another purpose; about its rim at equal distances apart were four loops, two of which remain (the others were in place when found, but soon crumbled away). Each loop is made of a twig tied into a circle 2 inches in diameter and is attached to the rim of the basket by a short buckskin thong. The whole interior of the tray shows much wear, particularly severe at the bottom where, indeed, it had begun to give out and was reenforced by overstitching with new splints, which themselves were partly worn through. The outside and bottom exhibit no wear at all. It seems likely that this basket was suspended by the loops and used for the simultaneous hulling and winnowing of seeds too delicate to be shelled in a mortar. The process might have been to keep a stone rolling among the seeds by shaking the suspended tray, and to blow off the hulls as they were detached by

[1] For details of this stitch, see Mason, 1904, figure 197. A Basket-maker basket from Grand Gulch, in which the last inch of the terminal coil is done in "false-braid" is mentioned by Pepper (1902, p. 16); exactly the same treatment appears in a basket from Step House, Mesa Verde (Nordenskiold, 1893, plate XLIV, 4); Dieguefio and Kawia (southern California) tray baskets also have the last inch of coil in "false-braid" (Peabody Museum Collections).



WHITE DOG CAVE

a, Covering for umbilical pad; b, c, Umbilical pads. (About ⅜.)

the bruising of the stone. This explanation is, of course, pure guesswork, but it seems to account satisfactorily for the presence of the loops and for the excessive wear on the inside.

Bowls. As will be seen in the illustrations (plate 23, a, c, f) these baskets are of lesser diameter than the trays and of much greater depth; their bottoms are flat and the sides rise more or less steeply. The largest is 14 inches wide at the mouth, by 8 inches deep. We believe that some of the larger bowls were used for boiling by the hot stone method, as two examples are heavily daubed with a mixture of mud and ashes applied, apparently, to render them watertight; they also have a soiled and battered look and many patches that indicate hard use.

Carrying Baskets. These are the largest of the coiled baskets, measuring 28 to 30 inches in diameter at the top, by 17 to 20 inches deep. They have pointed bottoms, oval in cross-section; and widely flaring upper parts (plate 23, k, l). By actual count of coils and stitches to the inch these are the coarsest of the baskets, yet they are as carefully and regularly woven as the finest; are very strong, but flexible enough to adapt themselves to the curves of the neck and shoulders of their bearers. There is no doubt that they served as panniers for carrying loads on the back; their shape and the use of similar forms by modern tribes are sufficient indications. The identification, however, is rendered certain by the fact that they all have pairs of loops, usually of human hair string, worked into their sides at the proper height for the attachment of head bands. In two specimens these bands are still in place. The common use of these panniers to cover interments is, of course, a secondary one.

Water Baskets. The excavations of 1916–1917 produced no whole specimen of this type, yet fragments of oval bottoms of a finer weave than is usual in panniers seem to indicate that such baskets were not rare. A fine example from Cave II, Kinboko, is figured in our former report. Dimensions: total height 17 inches, greatest diameter $14\frac{3}{4}$ inches, orifice $4\frac{1}{2}$ inches. It has an elongated base, oval in cross-section. The upper part flares out and becomes round; it is constricted again at the top, and the orifice is small. There does not seem to have been a neck, but there is some evidence that there was once a string-hinged cover. On opposite sides, just below the point of greatest diameter, are pairs of carry-

ing loops made by twisting into a heavy cord eight or ten two-strand human hair strings. The entire inner surface of the basket is thickly pitched with piñon gum, and the same material has been daubed on such parts of the exterior as had begun to wear through. A design of small stepped units may be faintly made out on the upper curve.[1]

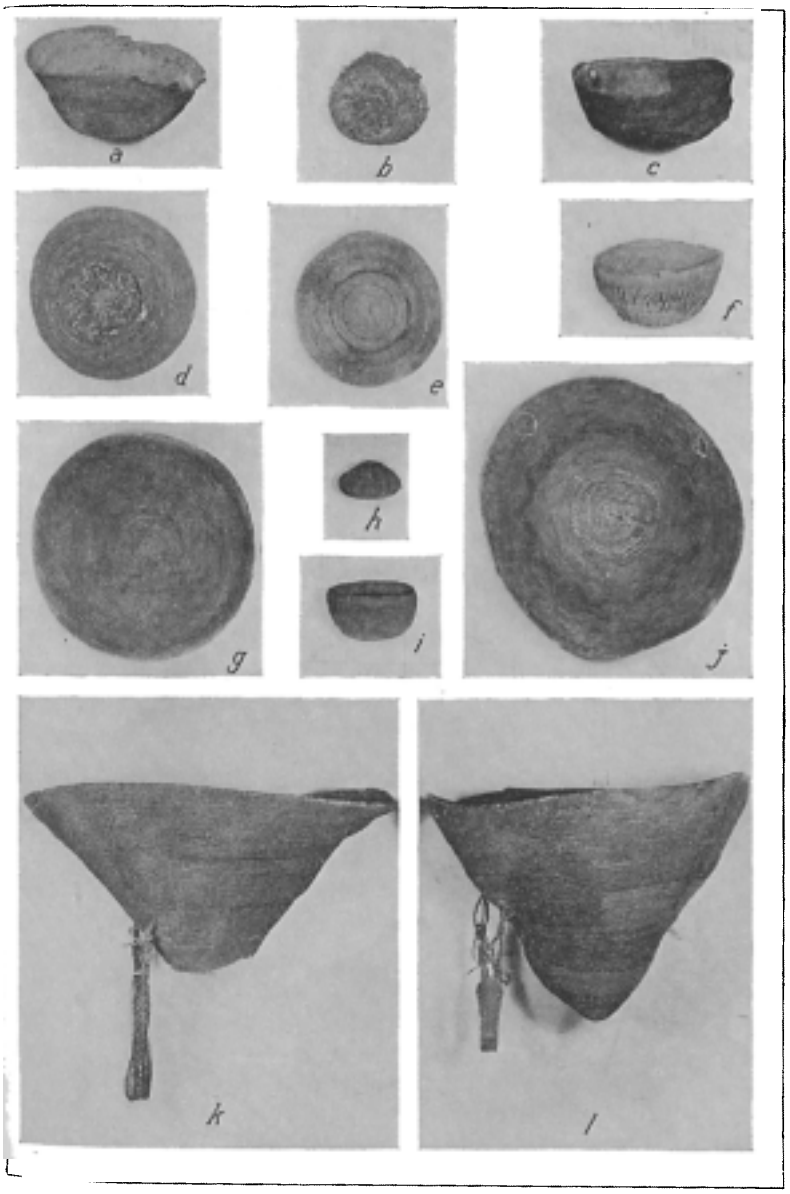
Trinket Baskets. These are neatly made little receptacles with round bodies and small orifices. The range of sizes and shapes is shown in the illustrations (plates 23, h, and 24, d). It is probable that these baskets were put to a variety of uses; many of those found in the graves contained small trinkets of one sort or another.

Decoration. Baskets of all the above types were ornamented with designs in black. Red elements, reported by Pepper[2] in Grand Gulch baskets, are not found in our collection. The designs are of great interest because they are without much doubt the oldest examples of basketry ornamentation that have yet come to light in the United States. Furthermore, they illustrate the decorative art of a people who preceded the pottery-making tribes of the region, and so may eventually be expected to throw light on the vexed question of whether or not southwestern pottery designs developed from those of basketry. We give, accordingly, all the decorations that are sufficiently well-preserved to copy (plate 24). These, together with the fine series of baskets figured by Pepper,[3] will give the reader a very good idea of the make-up of the designs. Descriptions of the patterns tell no more than do the pictures, and any attempt to supply symbolical meanings to designs as old as these would naturally be pure guesswork. We have made notes towards a comparative study of these and the designs of the baskets from the Plateau and Pacific Coast areas, but they are as yet far from complete, nor have we space in this publication to present the mass of data which has already accumulated. It may be said, however, that the art as a whole seems to find its nearest parallel in that of the central and northern California tribes. In technic, on the other hand, the baskets most closely resemble those of the Paiute.

[1] Kidder-Guernsey, 1919, p. 170 and plate 78.

[2] 1902, p. 15.

[3] Ibid., the same pictures may also be found in Mason, 1904, a more accessible publication, plates 84, 104, and 205 to 211 inclusive.



Baskets: All from White Dog Cave with the exception of h, which is from Cave 1, Kinboko Canyon, Marsh Pass. (About 1/16.)

Twilled Basketry. The only specimen in this weave is a flexible bag-like basket of yucca leaves with flattened spherical body and small mouth. Although it is fragmentary, the following measurements are approximately correct: width 8½ inches; depth 4½ inches; diameter of aperture 4 inches. It is made of entire leaves of *Yucca angustifolia;* the butts of the leaves are turned outward over a heavy fiber cord that rings the mouth of the basket, and are fastened by twined strings. The long ends of the leaves are then plaited together, over-two-under-two, to form the body. The bottom is not woven, the last couple of inches of the leaves being simply laid across each other and tied in that position with string (plate 23, b).

Although the over-two-under-two weave is the same, this specimen is entirely different from the twilled ring baskets so abundantly found in cliff-houses.[1] The latter are always bowl-shaped and have a wooden hoop at the edge. They are fabricated upwards from the bottom; not, as in this case, downwards from the rim. No trace of ring baskets has yet come to light in our excavations in Basket-maker caves; a bit of twilled work found in Cave 1, 1915,[2] was probably part of a flexible bag-basket like the present one.

TEXTILES

Plain Weaving. As the collection of Basket-maker textiles described in our first report contained no example of straight over-and-under weaving, we believed that the Basket-makers practised but two technics, namely twining and coiled-netting (coil without foundation). Among the material collected in 1916–1917 there are, however, three pieces of plain over-and-under weave. The largest of these is the cloth outer wrapping of the infant from Cist 13, White Dog Cave. Though much torn and showing long use, enough remains so that by arranging tattered ends of selvage in their proper positions one dimension is shown to be 27½ inches. The other, based on extending the design to a symmetrical termination, would be 26 inches. It is probable that allowing for error in these measurements the original piece was square. The general appear-

[1] See Kidder-Guernsey, 1919, p. 108 and plate 43. The specimens figured by Pepper (1902, p. 23) are probably not Basket-maker, particularly as one of them was found filled with beans; the basket shown on p. 25, however, seems to be identical with the one under discussion.

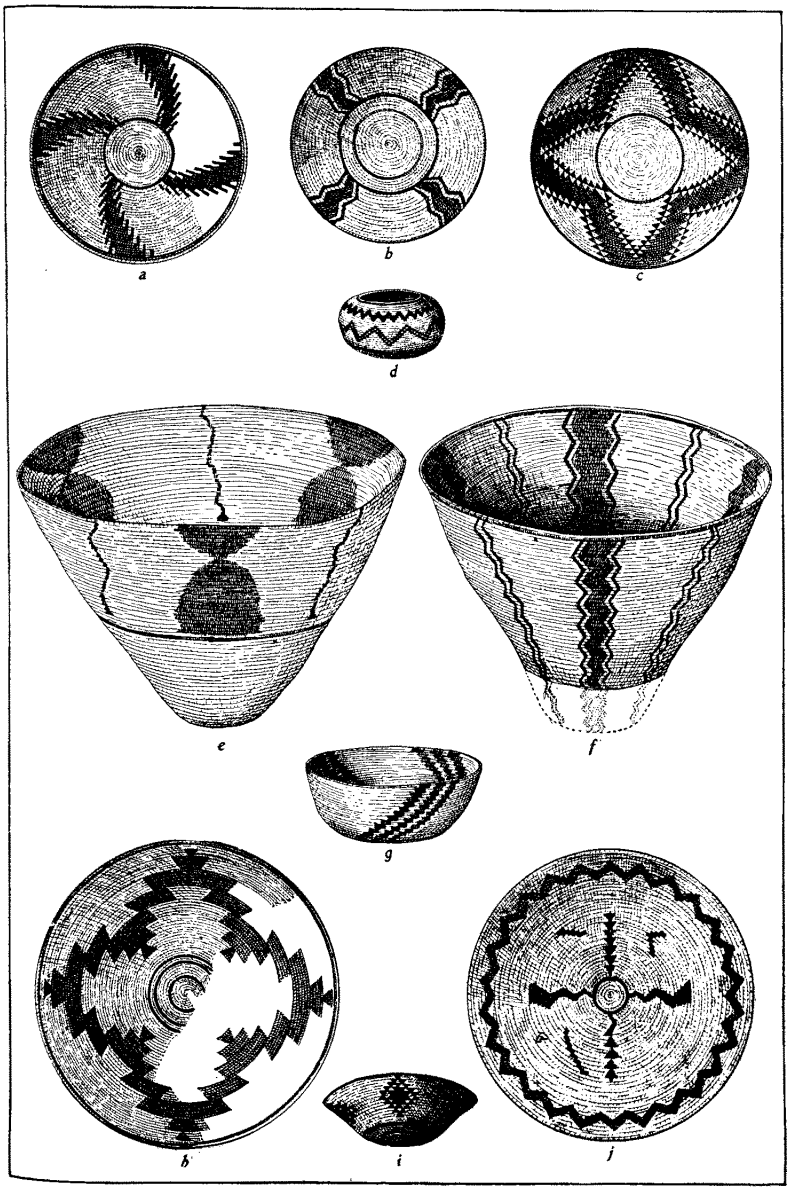
[2] Kidder-Guernsey, 1919, p. 167.

ance of the fabric is the same as that of the twined-woven bags both in color and design, the difference in technic not being apparent at first sight. The weave is rather coarse, having nine warp and fifteen weft strands to the inch. Both warp and weft are of a uniform sized two-strand twist of rather coarse vegetal fiber presumably yucca. As far as it is possible to work it out from the scant material at hand the weave is as shown in the diagrammatic drawing, figure 11, b. Details as to the manner in which the warp edge is finished appear in figure 11, b, and plate 25, c. The warp ends are cut close and the weft kept from unraveling by a buttonhole stitch. The edge running parallel to the warp is finished by twining two fine strands of human hair through the loops that result from turning back the weft for a new start; this also is illustrated in figure 11, b.

In the photograph, plate 4, a, there is seen at one point a circular hole, cut in the fabric, and finished all around by overcasting with fiber thread. The design (plate 26, b) consists of a series of large rectangles arranged in three rows, the two outside rows red, the center one black. The units average $2\frac{1}{2}$ inches long by $1\frac{1}{2}$ inches wide. Separately dyed elements were not introduced to produce the design; but apparently, when the weaving reached a point where a change of color was desired, the weft strand was thoroughly rubbed with color for the required length and then woven in. The warp cords show little color, such as appears on them probably resulting from contact with the weft. It is possible that the finished piece may have been treated with some mordant to fix the dye.

The second example of this weave is a fragment 12 inches long by 2 inches wide in very bad condition, one end showing darning. It is also from White Dog Cave. There are traces of a broad design in red, the exact character of which cannot be determined. The piece appears to be a part of a blanket very similar to the one just described. There remains a short section of one edge finished with a thread of human hair twined through the weft loops.

The third piece, from Cave 11, Sagiotsosi, was found with the disturbed burial described on page 37. It is very evenly woven with fourteen warp and twenty-one weft strands to the inch. The fragment has a length one way of 12 inches, and is a part of one corner of the original piece, so that two edges remain. Both warp and weft edges are finished in the same manner as the one first de-



Baskets: All from White Dog Cave with the exception of d, which is from Cave 2, Kinboko Canyon, Marsh Pass. (About 1/16.)

scribed: a buttonhole stitch of fine string, and human hair twining thread respectively. The design is in red and black, and so far as it can be traced is shown in plate 26, c. It is painted, not woven, and the color was applied only to one side of the cloth; the red pigment has soaked through the fabric and the red parts of the design appear faintly on the back. The black paint has not soaked through at all. To the corner is tied a dressed leather thong, which leads us to think that it may have been part of a garment.

These fabrics remind one strongly of the Coahuila cave textiles, many of which are large poncho-like blankets woven in the same

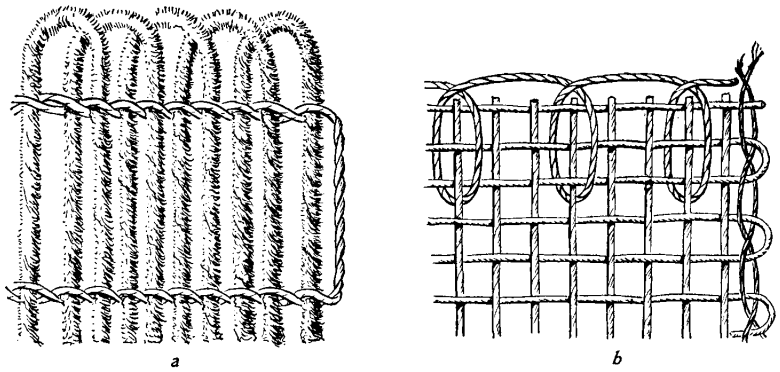


FIGURE 11

a, Detail of weave, fur cloth blankets; b, Plain woven cloth, detail of weave and selvage.

way as these, and also have one edge finished with the buttonhole stitch. The latter resemblance seems significant, since we have not been able to find in the Museum collection textiles from any other region so finished. The designs, it is true, are different, though some of the elements seen in the Basket-maker twined-woven bags are also found in the Coahuila blankets.

The zigzag lines seen in the second specimen (plate 26, c) are very similar to the zigzags painted on the breasts of certain square-shouldered Basket-maker pictographs from the Monuments.[1] This resemblance has suggested to us that these woven fabrics may have been used as shirts.

Twined Weaving. The bags illustrated on plates 26, 28, and 30 form one of the most interesting groups in the collection, not only

[1] Kidder-Guernsey, 1919, p. 197, figures 100, 101.

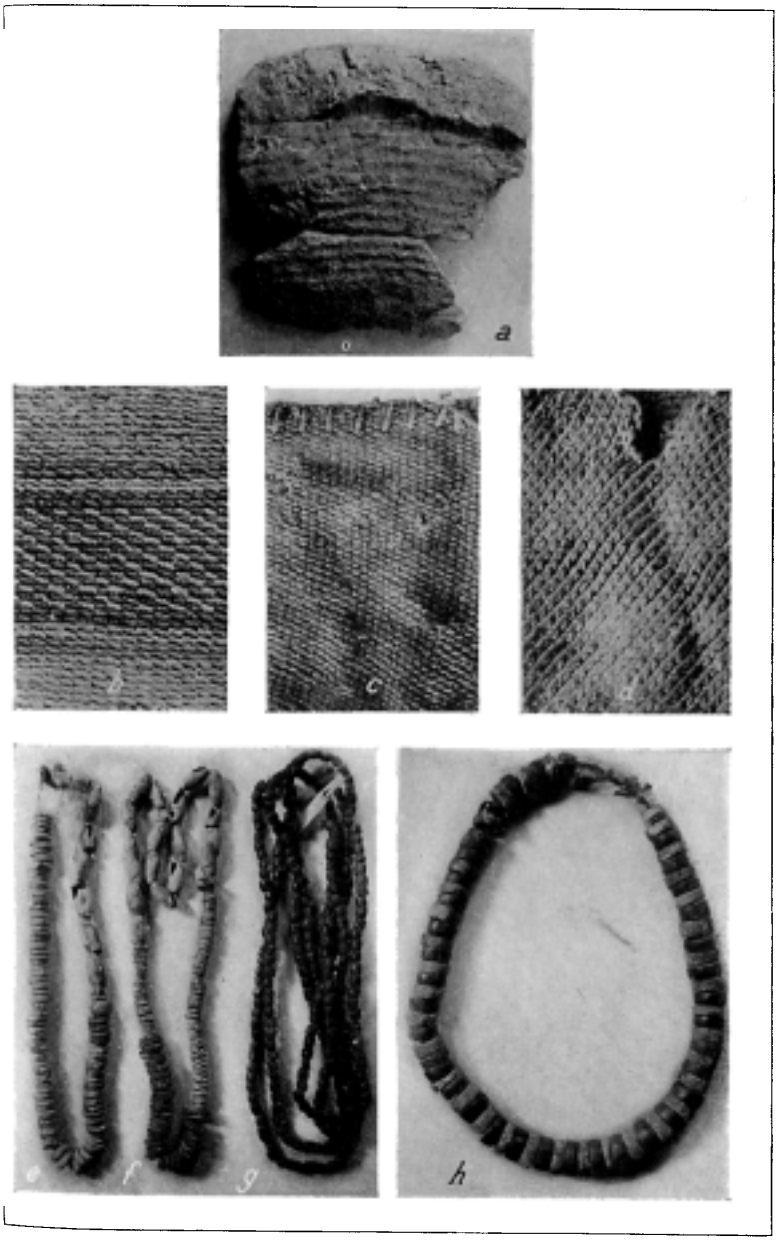
because of the excellence of their manufacture and the variety and beauty of their decoration, but also because they are so peculiarly characteristic of the Basket-maker culture. We have, fortunately, a large amount of material: complete bags to illustrate size, shape, and design; and great numbers of rags and fragments to make clear the details of technic.

The bags are flexible seamless sacks with full, round bodies and long, gradually constricted necks (plate 26, a, d). They range from 1½ inches to 2 feet or more in length. All are made in the same way, of close twined weaving; the majority of specimens have both warp and weft of two-ply apocynum string, though some have yucca warp and apocynum weft. The combination of apocynum warp and yucca weft is rare.

Our study of the weave was begun by examining the bottoms of the bags in order to make out how the preliminary "set-up" of the warp cords was accomplished. By dissecting several fragmentary specimens we found that there were two methods, one common, the other rare. The former was as follows: six long strands were laid across each other, three above and three below (figure 12, a); the middle strand of each set of three runs out straight, the others are bent so that their ends radiate from the common center. There are thus produced twelve original warps. The second method consists of twisting three strands about each other and then bending their ends so that they radiate and form six warp cords (figure 12, b).

The above systems are very simple and practical, and avoid the ugly lump and the potential weakness in the fabric which would have been the result of knotting the warps together at the base. The method of inserting the weft also obviates knotting: a single long string is worked over and under the radiating warp cords close about their common center; this is shown slack in figure 12, a, b; in reality it is pulled up very tight and holds the warp firmly together. When a circuit of the spoke-like warps has been made, the two ends of the weft string of course come together; they are then combined into a single strand of twined weaving, which continues spirally around and around to form the body of the bag fabric.

To return to the warp-skeleton. Many large bags have as many as three hundred and fifty warps at their point of greatest diameter.



a, Pottery, Cave 6; b, Twined-woven fabric, White Dog Cave; c, Plain woven fabric, Sagiotsosi Canyon; d, Coiled netted fabric, White Dog Cave; e–h, Necklaces, White Dog Cave.

It is obvious that these could not all come together at the bottom of the bag; hence the base begins with six or twelve warps only (as described above) and sets of new cords are introduced as the original ones radiate away from each other. Upon the number of new warps depends the size of the finished bag; and upon the rapidity of their insertion depends the degree of flare imparted to the base. If many new warps are added close to the bottom, the latter will naturally be very flat; if they are put in more gradually the bag will have an egg-shaped base. Figures 13, a, b, illustrate

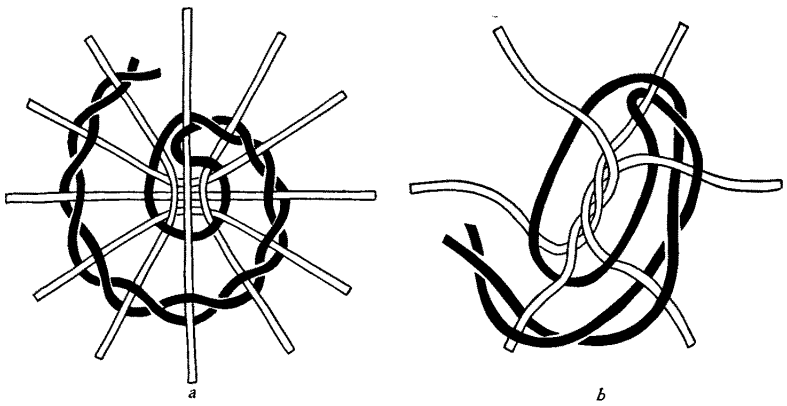


FIGURE 12

Methods of arranging and binding warp cords when beginning the construction of twined-woven bags. The weft cords are shown in solid black.

this; each one represents, diagrammatically, a circle about $1\frac{1}{2}$ inches in diameter at the bottom of a bag. In figure 13, a, the original twelve warp cords are multiplied to forty-eight by two series of insertions, the first or inner series consisting of twelve new cords, the second of twenty-four. In figure 13, b, the same total is arrived at, but there are three series of insertions; the first of six, the next of twelve and an outer one of twenty-four. Figure 13, c, shows an area of bottom no greater than in the former specimens, but containing seventy-six warps, set in as follows: original series twelve, first insertion series twelve, second series fourteen, third thirty-eight. The weft in all three cases is woven in with approximately the same degree of tightness; hence the warps of a and b are pulled close to each other and the bags have

narrower bottoms than in c, where the quicker insertion of warps allows the base to grow rapidly broader.

We have not yet mentioned the actual method of inserting new warps. Two ways were employed. In one (plate 27, b) the string to be added was looped and laid between two of the old warps (b, b′) thus forming two new ones (a, a′); the first two or three turns of the weft (c, c′) attach the new strands to the old warps on either side of them holding all firmly in place; the next turn of weft (d) takes in each new element separately and the weaving continues normally.

In the second method (plate 27, a), the strand to be added was doubled into a loop, making, as before, two new warps; the string

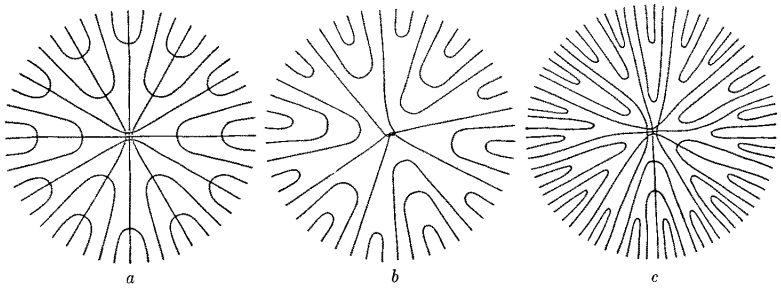
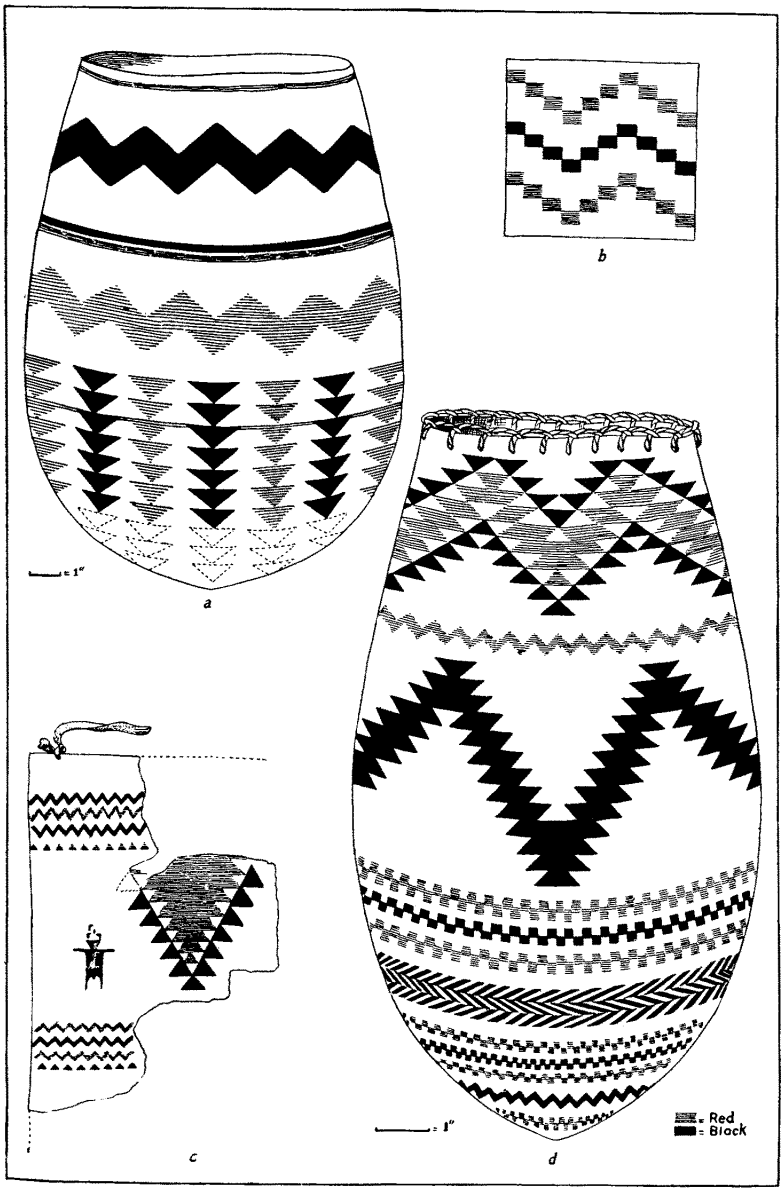


FIGURE 13

Methods of inserting new warp cords to increase diameter of bottom of bags.

at the bend of the loop was twisted apart into its two component plies and one of the old warps (b) was threaded through the resultant opening; the loop (a, a′) was then slid up the old warp and brought close against the last woven turn of the weft (c), thus producing a pair of new warps (a, a′) one on each side of the original one (b); on its next revolution about the bag the weft (d) takes in the two new warps and holds them solidly.

By the two methods just detailed the new warps become integral parts of the fabric without leaving any loose ends and without necessitating any disfiguring knots. The tension on the warps, however, incident to the use of the bags, tends to pull the loops very tight and so away from the last weft turn woven previously to their insertion, thus producing the little open space in the web indicated in the two figures. Where many new warp-pairs were introduced (as in the outer circle of figure 13, c) these little holes



Textile designs: a d, Twined-woven bags; b, c, Plain woven cloth.

naturally lie close together and make very characteristic open-work rings about the bottoms of the bags.

The two different ways of adding warps (figure 13, a, b) are about equally common. In most bags either one or the other is adhered to; occasionally the two are mixed (figure 13, c). All bags seem to start with either six or twelve original warps, the ultimate size of the fabric depending on the number of new ones introduced; a medium-large bag (A–3054) had at its point of greatest diameter a total of about three hundred and fifty warps. Almost all specimens are more or less constricted toward the mouth; this is accomplished partly by tightening the twining of the weft and thus bringing the warp closer together, and partly by dropping out warps. A warp to be dropped is merely cut off and its end hidden by the next turn of the weft.

The final point in the study of the warps is the method of securing them at the edge or mouth of the bag to insure a strong and ravel-proof selvage. This was sometimes accomplished by turning the warp ends about a stout edge-string (figure 14, a) and running them back a little way on themselves; they were held in this position by the last few turns of the weft; their loops about the edge cord were then pulled tight and the ends of the cords clipped off close to the fabric. In other cases the warp ends were looped under each other, then gathered into bundles of four or five, tucked with an awl through the fabric just below the edge and finally clipped (figure 14, b). A third method also dispensed with the edge-cord: each warp was bent at the edge, paired with the warp next it, run back along it towards the bottom of the bag, held by the upper weft-turns, pulled snug, and clipped (figure 14, c).[1]

We now take up the twining of the weft, which is perfectly simple and regular. It begins at the very bottom (figure 12, a, b) and continues in a close spiral to the mouth. Fresh lengths of weft string were not tied to the ends of the old ones (these weavers seem to have had a deep-seated aversion to knots), but were run a little way with them until firmly set. The entire weft, while made, of course, of many pieces, is thus essentially continuous. The method of procedure is unknown; it is probable, however, that the work was downward, the base of the bag having been attached

[1] Compare with a similar method of fastening warp ends in Cliff-dweller sandal heels (Kidder-Guernsey, 1919, p. 104 and figure 38).

to a limb or pole and the warps allowed to hang either free or tied in loose bunches to prevent tangling.[1] The twelve-year old daughter of one of the authors has experimented with this technic and has quickly become expert in making the bags. She holds the two weft-strings loosely across the palm of her hand separated by the index finger and gives the twist necessary to cross them between warps by merely turning the hand over. Each successive warp is hooked up and drawn between the wefts with the index finger. No tool is necessary for beating up the weft, as it

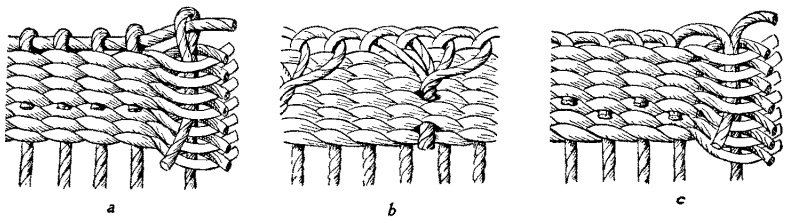


FIGURE 14

Various methods of finishing the top of twined-woven bags.

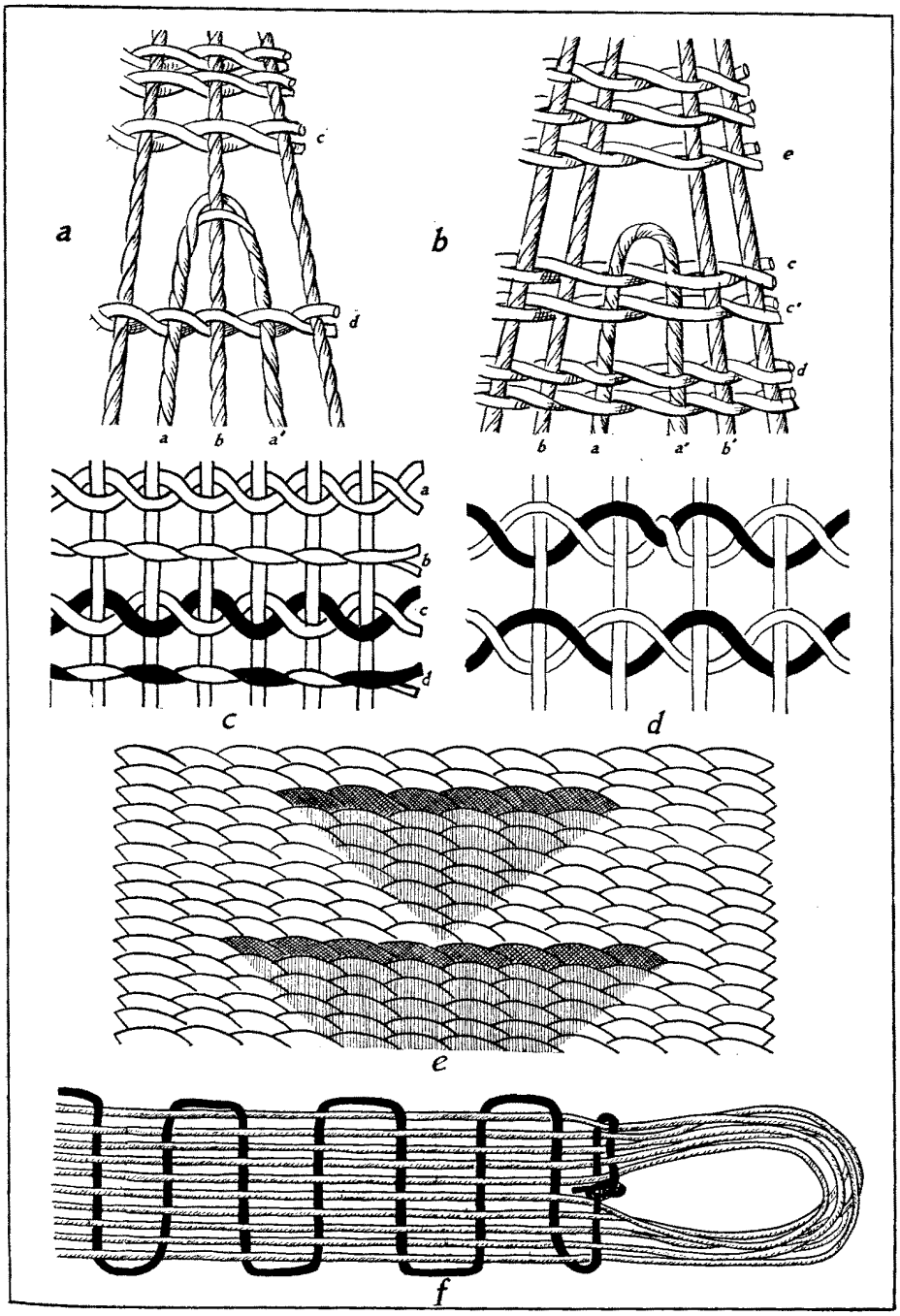
can be made to sit tightly by a slight pull after every few warp crossings.

The weave of the ancient specimens is very even, and the number of wefts per inch over the whole surface of any given bag is always practically the same, though the warps at the necks of constricted examples are pulled somewhat closer together than they are at the swell of the bodies. The coarsest weave in the collection (A–3005) has five warps and fourteen weft-pairs per square inch; the finest (A–3161) has fourteen warps and twenty-three weft-pairs. The normal texture lies approximately half way between these two extremes with about nine warps and seventeen or eighteen weft-pairs.

The decoration of the bags is no less interesting than their structure. There are two styles, woven and painted, both sometimes appearing on the same piece.

The woven ornaments were accomplished by what may be termed the " dyed weft " process. When a band of color was to be introduced a new weft-pair of the desired shade was not added,

[1] See a picture of a Virginia Indian woman weaving a bag-like basket, Mason, 1904, figure 148.



a–e, Details of twined-woven bags; f, Detail of plain woven carrying-strap.

but the weft then in use was itself stained or rubbed with dye for the requisite length and then woven in. While there is no reason why very short lengths of weft should not have been so colored and small unit figures thus produced, we have found no instance of the practice in the twined bags,[1] all the designs being in the form of bands completely encircling the bodies of the sacks. These bands are infinitely variable, but all are made in the same way and are very easily analyzed. To understand them one must keep in mind that in twined weaving a double weft is used, the two elements of which twine both about each other and about the warps. Each of the two elements crosses every other warp, hence all the warps are crossed (plate 27, c, a); and when the weft is pulled tight the warp is entirely hidden, each weft element (in the pair) appearing on the surface of the fabric over every other warp. If the two elements are of the same color the resultant line of weaving will be monochrome; if of different colors, the line will be "beaded," half of one color, half of the other (plate 27, c, d).

The bodies of the bags are woven of undyed apocynum, a warm yellowish-brown. The band designs are commonly in red, black, or a mixture of the two (plate 28).[2] The simplest are the single lines in solid black or solid red that encircle the bases of most specimens as shown in this plate. By introducing wefts with one black and one natural element, or one red and one natural, beaded lines are produced and these are combined to make up the great variety of bands shown in the illustrations. They are all narrow (the widest in the collection contains but twenty-four lines) and no two, except the simplest types (such as plate 29, c), are ever exactly alike. A favorite practice was to make a band containing both red and black as in b, of this plate, and then weave just above it the same band with the colors reversed. A little study of the detailed drawings in the plate will show better than any amount of description the nature of the patterns and the ways in which, by combining "beaded" and solid lines, the different vertical, horizontal and oblique effects were produced.

[1] Except as "markers" in painted designs (plate 27, e). See, however, the woven fabric (plate 26, b), where squares are made in this way.

[2] There is one specimen (A–3056) with a band in brown; this dye caused the string to which it was applied to rot rather badly. Another bag (A–3005) has two lines each one made of one red and one dark blue strand. The third case of the use of colors other than the conventional red and black, is the appearance of a few yellow lines in A–3470.

The type of pattern illustrated in e, is the only one which needs explanation. Normally the weave of the bags is counter-clockwise, and a series of " beaded " weft-rows produces an oblique design, whose lines run downward to the right as in a. By shifting the weave to a clockwise direction, the slant of the oblique lines is changed and they run downward to the left. The decoration shown in e, therefore, was made by introducing three clockwise rows, then six counter-clockwise, and finally six clockwise. There are but two examples of this style in the collection.

One further point should be noticed: the weft is continuous, going around and around the bag; if the number of warps were even, and if (for example) a weft-pair of one black and one natural strand were being used, the black strands would, at each successive revolution about the bag, cross the same warp, and a series of vertical black bars would be produced (as in the two upper rows of f). If on the other hand, the number of warps were odd, the emergences of the black strand on the surface would be offset at each revolution and the resultant design would be oblique as in a. As both types, vertical and oblique, often occur in the same band, as shown in d, it is obvious that when the change from oblique to vertical or vice versa was to be made the weaver had to employ some device to reverse the order of emergences of her alternating colors. How this was done is shown in plate 27, d.

Painting, the second style of bag decoration, would call for little notice beyond the illustration of the designs themselves, were it not for two very interesting peculiarities, namely, the practice of applying the designs to the inside as well as to the outside of the bags, and the use of markers woven in, apparently to aid in this duplication. These methods were employed in the decoration of the bag shown in plate 30, f, and restored in color in plate 28.

Perhaps the clearest way of presenting the technic is to describe the steps by which we arrived at an understanding of it. We had examined the bags a number of times and had always supposed, because the designs appeared on both sides of the fabric, that they had been woven in probably by means of the dyed-weft method; closer scrutiny, however, showed that the vertical and oblique edges of the figures were perfectly even and straight, not finely serrated or stepped as is always the case with such edges in a woven design. Under a magnifying glass the edges of the colored

White Dog Cave
Color-scheme of woven bag.

areas proved to be formed not by the stitches of the weave, but to run quite independently of them as illustrated in plate 27, e. This showed, of course, that the designs had been painted on, not woven in; but we were still at a loss to account for the accuracy with which they were reproduced on the reverse of the fabric (we had pushed pins through the weave at various juts and corners of the figures and had found that their points protruded at exactly corresponding places in the designs on the other side). We then decided that some dye must have been used which struck clear through the material and colored both surfaces. This explanation satisfied us until we chanced to pry apart some of the weft strings, and noticed that their under parts and the warps were not colored. This puzzled us greatly because we could not conceive of a dye which would act on both surfaces of a cloth without affecting its body. We then returned to our pin tests, and eventually discovered a few places where the designs on front and back failed to correspond by a small fraction of an inch, and one spot where there was an error of a quarter of an inch.

It was then clear that the two sides had been painted separately, but we could not understand how the elaborate patterns had been duplicated so exactly. Further examination cleared up this question also. We noticed that the top line of weaving in many of the colored units was of a darker shade than its body; on picking one of these upper lines out, we found that for the space necessary to cross the top of the design-unit, both its strands had been tinted before weaving in (weft-dyeing). These little colored lines or markers appeared, of course, on both sides of the fabric and must have made it quite easy for the weaver to paint identical patterns on each. They must also have been of great assistance in the original laying-out of the designs, for by introducing markers at regular intervals (ascertained by counting warps) along any single line of weft, regularity of spacing in a horizontal sense could be accomplished; by counting weft lines as they were woven upward from the one last marked and then marking a new weft, symmetrical vertical spacing could be insured (see plate 27, e; the shade of the markers is there exaggerated).

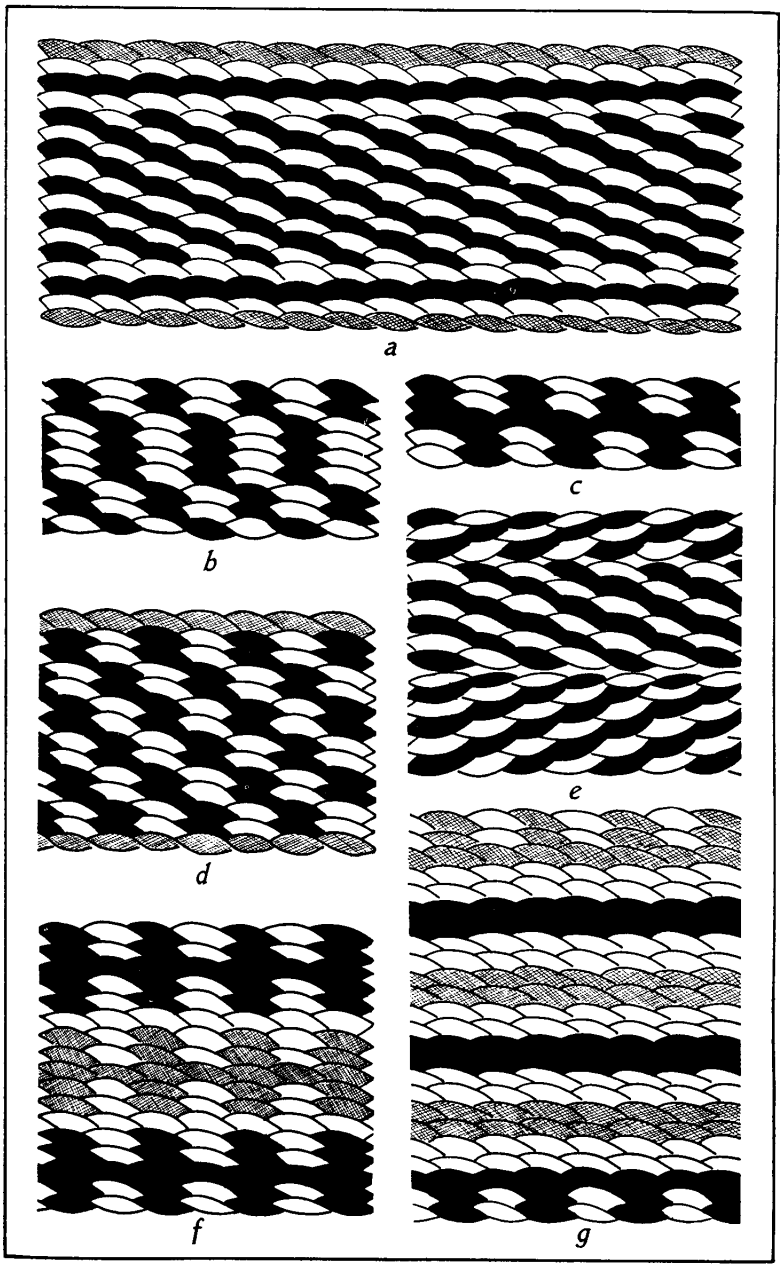
One further point: we experimented with water-color paints on bits of the bag fabric and found that it takes them without any blotting or running; furthermore the moisture in the paint (carry-

ing very little of the color itself) quickly soaks through and shows on the reverse side in sharply defined wet areas of exactly the same shape as the painted figures. By painting over these moist areas the decorator was still further aided in the accuracy of the duplication of the design.

This painstaking reproduction was accomplished on nearly all the painted bags in the collection; there are but few specimens decorated on one side only. Its purpose is not obvious, for while the bags are reversible, the weave being the same within and without, specimens showing long use are much more worn on one side than on the other. It seems, therefore, that the patterns on the inside were normally invisible. That they were so meticulously carried out may be due to the strong craving for perfection and love for detail possessed by so many primitive craftsmen; or it may have resulted from an equally common psychological trait, namely that of wishing to carry over into a new technic the qualities of an older one. To be explicit: it is likely that basket-making was practised by these people before they learned to weave this specialized type of bag; the painted patterns under discussion are also found woven in the baskets (compare plate 24 with plates 26 and 28); hence it may be that when painting such decorations, it was thought proper that they should appear on both sides of the fabric as in baskets.

Fur cloth. This was one of the most important textile products of the Basket-makers. Robes of fur cloth were presumably the usual overgarment for cold weather, were doubtless used for sleeping blankets, and were invariably wrapped about the dead previous to burial; young babies were provided with specially shaped fur cloth coverings (plate 4, b, f).

The strings that compose the body of the fabric were variously prepared. The commonest method was to wrap a yucca cord with narrow strips of the hide of small animals applied raw and with the fur on; deer and mountain-sheep skins, when used, were generally dressed. The strips were applied spirally, the end of one piece holding down the beginning of the next. The tight wrapping of the hide caused the hair to stand out in all directions, thus giving the finished string the appearance of a greatly magnified pipe-cleaner. Another way of making the string was to catch tufts of long, woolly animal hair (dog or buffalo) detached from the hide,



Twined weaving; designs produced by different manipulations of the weft-strands.

through the twists of a two-ply cord; the same was also done with small patches of skin from the heavily furred bottoms of rabbits' feet. Strips of tough skin with the hair on were sometimes twisted upon themselves instead of being wound about a cord.

The weaving process was very simple; the prepared string was wound about some sort of frame, or perhaps around a pair of long pegs driven in the ground. The winding was done in such a way as to lay each succeeding turn of the string parallel to and close against the preceding one. When the desired size was reached, the strings were fastened together by twined rows of yucca cord; finally, the frame was removed. To illustrate the nature of the selvages, a corner of one of these fabrics is shown in figure 11, a. The upper edge is composed of the looped turns of the single long fur-string which forms the body of the cloth. On the lateral selvage may be seen the method of bringing the continuous twining cords down the edge for a new crossing.

Due to the wide spacing of the rows of twining cord, the texture of fur cloth is very loose. The component string is, however, so fluffy and hangs so evenly between the twined cross-rows, that the finished blanket has a very smooth surface; it is also softer and more flexible than the best dressed hide. Pleasing blends of color were produced by mixing different kinds of fur; ornamental edgings and tassels were sometimes made by using bits of string wrapped with strips of downy bird skin; or strings between the plies of which were held pieces of rabbit foot fur, colored red.

Narrow Fabrics. Carrying bands were employed for the transportation of heavy loads. We have found them attached to the large pannier baskets (plate 23, k, l), and one accompanied the bulky bundle containing a hunting net discovered in White Dog Cave. It is probable that they were also used with cradles. They are long woven straps with loops at either end. Although individual specimens differ from each other in dimensions and in the details of weave and ornamentation, most of them are fundamentally alike in that they are made of a long cord looped into a flat skein and held together by a single binder, which runs over and under, back and forth across it. The binder terminates just before reaching the ends, thus leaving two loops for the attachment of the strap to the burden (see the diagrammatic drawing, plate 27, f). Ornamental patterns are sometimes introduced by making the

skein of strings of contrasting colors, or by using a binder of a color different from the rest of the fabric.

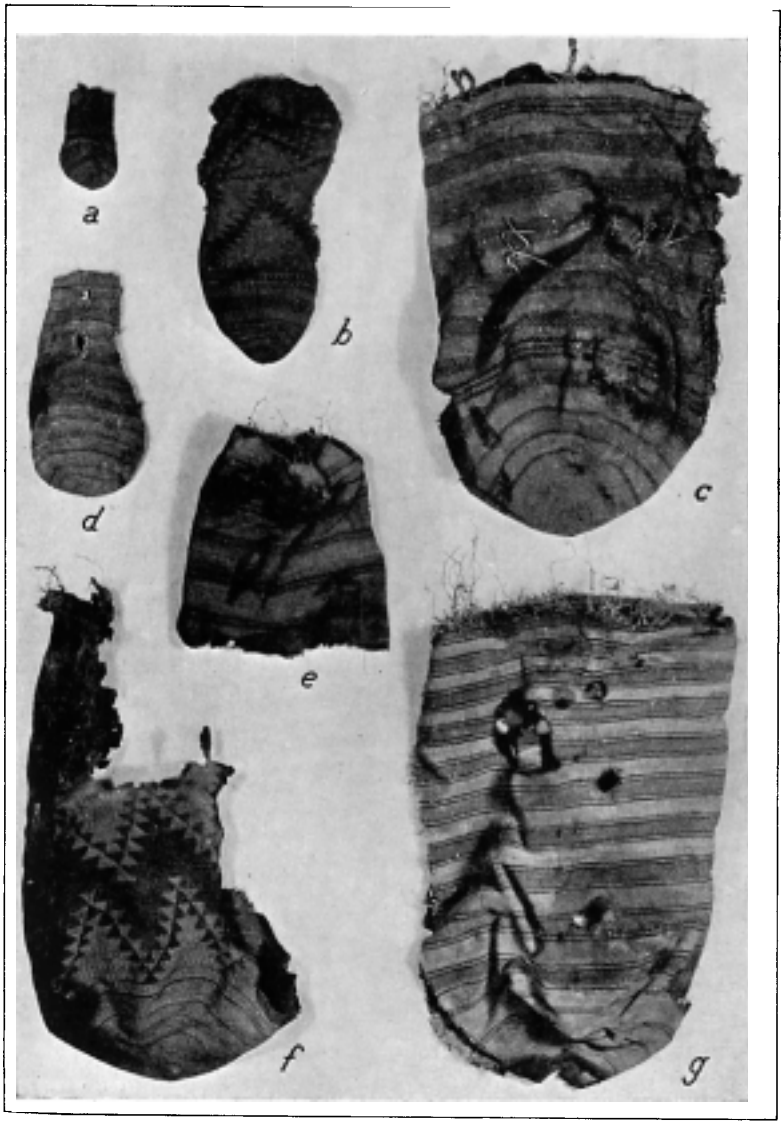
One of the straps found with a pannier basket (plate 23, k) is made of a single heavy yucca fiber string looped on itself twelve times to form twenty-four parallel elements; the binder is also of yucca. The length of the specimen is 22 inches, width $1\frac{1}{2}$ inches. The second pannier strap is longer, 32 inches, but of the same width. It is composed of yellowish fiber and black human hair strings, alternated to produce a simple design; the binder is yucca. There are also several fragmentary bands of the same weave, in one of which (A–3495) the one remaining loop is tightly wound with fine string.

The band found with the rabbit net (plate 31, c) is constructed on the same basic principle, but its binder, instead of being covered by the longitudinal strings, forms the surface of the fabric. In making this strap, a single stout yucca cord was looped four times, producing eight parallel strings; the binder is woven back and forth over and under these; it is a heavy cord twisted of a mixture of dog and buffalo hair, and is so fluffy and is beaten up so tightly that the underlying yucca strings are entirely concealed except at the ends, where they protrude to form short loops for the attachment of tie-cords. The specimen is 22 inches long and $2\frac{1}{2}$ inches wide.

Tape. Very narrow flat fabrics were made on the same general principle as the coarser carrying-straps, but the materials are finer and the weave more elaborate. They are rare, our only new example being a short length of tape $\frac{5}{16}$ of an inch wide which was found attached, apparently as a tie-string, to a large fur cloth robe enveloping mummy 1, Cist 24, White Dog Cave. It has parallel longitudinal elements and a single binder; the parallel strings are twenty-eight in number, arranged in fourteen pairs which twine about the successive crossings of the binder instead of merely passing over and under them as in the carrying-straps. The design, produced by mixing brown and white strands, is very similar to that of a tape found in Cave 1, 1915. In number of elements and in weave the two specimens are identical.[1]

Rigid bands. We have only a single specimen of this type, but there is a very similar one from Grand Gulch in the American

[1] Kidder-Guernsey, 1919, p. 173 and figure 82.



Twined-woven bags. All from White Dog Cave with the exception of d, which is from Cave 6. (About ⅛.)

Museum of Natural History in New York. Our example (White Dog Cave, A–3452) is composed of thirty slim, peeled willow twigs laid side by side to form a flat band 4½ inches wide and held together by a tight, twilled over-two-under-two weave of fine string. The upper part of the cross-weaving is in human hair string, the lower of apocynum. The object is 9½ inches long, but is broken off at both ends so that we cannot even guess at its original length, nor at the way in which it was finished.

NETTING AND CORDAGE

Coiled Netting.[1] A bag from White Dog Cave is our best example of this technic. It is a little apocynum string sack, 6 inches long, with rounded body and constricted neck. The stitch is very even and regular (plate 25, d); there are twelve coils to the inch and each coil has nine loops to the inch. The entire bottom of the bag is red; the neck is in natural color, encircled by narrow bands of red and brown. As there is no sign that new strings were introduced to make the changes in color, it seems probable that the entire fabric is made from a single long strand, which was stained or rubbed with pigment for the proper length whenever it was desired to produce a colored band.

Rabbit Net. This remarkable specimen, which, according to Dr. J. W. Fewkes, is probably the largest piece of ancient textile so far recovered in North America, is from White Dog Cave. When found it was rolled upon itself, partly wrapped in bunches of fiber, and tied into a neat bundle with yucca leaves. Undone and spread out, it proved to be a net 240 feet long, 3 feet 8 inches wide, and with meshes 2½ inches square. It is in perfect condition and, except for a single strand which has at some time been burned through by a stray spark, is as firm and strong as the day it was made. The material is a two-ply twine of Indian hemp (*Apocynum cannabinum*), very firm and evenly twisted and about $\frac{3}{32}$ of an inch in diameter. An estimate of the amount of string composing the net gives approximately 19,581 feet, or very nearly 3¾ miles. Extending the length of the long edges and across the ends is a marginal cord, of stouter two-ply yucca string; the method of attaching this can be seen in plate 31. The mesh-knot is one that is

[1] This term has been suggested by Mr. Willoughby as a more appropriate one than Mason's "coil without foundation"; for a diagram of the weave, see Kidder-Guernsey, 1919, figure 45.

used almost universally. The entire net is of the same mesh, but there are two sections, one 9 and the other 6 feet long, in which human hair has been used with the apocynum fiber, one strand of hair twisted with one of fiber.[1] These sections are naturally of a darker color than the rest of the specimen. Strung on the cord of one of the meshes is a single olivella shell bead, another bears two stone beads; still another has attached to it a few downy feathers which may be seen in the plate; on a fourth is a small pink feather, and at a fifth place there is a paw of some small animal tied on with sinew.

Attached to the net when found was a carrying-strap of coarse dog or buffalo fur-string. Such a strap was no doubt needed for transporting the net, as the whole bundle weighs over twenty-eight pounds. The bunches of fiber that partly enclosed the rolled up net are of Indian hemp (the same material in its raw state as the twine); it is stripped up and tied in hanks in much the same manner as are the trade bundles of Indian hemp in the Peabody Museum collected from the Thompson Indians.

The method of using nets such as this is made clear by the following quotation from Powell:[2]

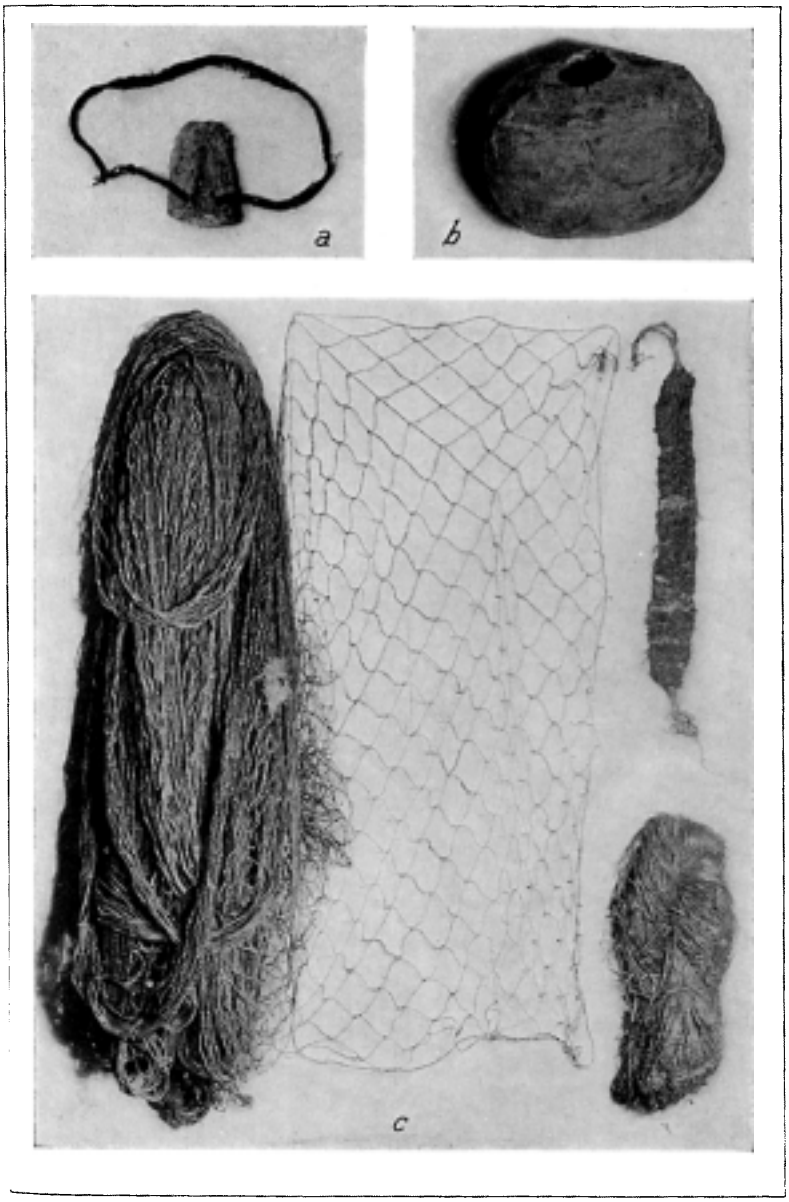
> They (the Paiute) get many rabbits sometimes with arrows sometimes with nets. They make a net of twine, made of the fibers of a native flax. Sometimes this is made a hundred yards in length, and is placed in a half-circular position, with wings of sage brush. They have a circle hunt, and drive great numbers of rabbits into the snare, where they are shot with arrows.

It has occurred to us that the hair string sections, being darker than the rest, might have been intended to lure the quarry toward them, for, to a frightened animal they might appear to be openings.

Of interest because of its close similarity to the present specimen is a rabbit net in the Peabody Museum that was collected from the Paiutes about 1870 by Dr. Edward Palmer. Its length is 124 feet, width 4 feet. The mesh is practically the same, and the material is also apocynum fiber; furthermore, there are sections which appear darker than the rest of the body, though no human hair string is used. This net is provided with a number of light crotched sticks which were used to hold it upright when set. No such sticks were

[1] From Cave 10 came a fragment of another net of the same weave and mesh size; this piece is also made of human hair and apocynum string.

[2] 1875, p. 127.



WHITE DOG CAVE

a, Umbilical pad; b, Gourd vessel; c, Rabbit-net, carrying-strap and bunch of fiber found with the net. (About 1/10.)

found with the specimen from White Dog Cave. In the collection from the caves of Coahuila, northern Mexico, is a fragment of netting similar to the above. Heye records a fragment of yucca rabbit net from a Diegueño cache pot.[1]

Snares. The best preserved of the three specimens of snares found in Cave 6, measures 8 feet 6 inches in length and is made from twelve strands of twisted yucca fiber, braided into a rope $\frac{5}{16}$ of an inch square. At one end is a loosely tied knot, at the other a loop, 2 inches in length. This loop is not spliced or seized to the body of the rope, but is an integral part of it (plate 32, a). To accomplish this, a piece 7 inches in length was first braided with six strands, then doubled to make the loop, and the twelve strands thus brought together were braided to form the rope itself.

A second specimen made of the same material and in the same way measures 7 feet, 4 inches in length.

The third snare though made in the same way as the other two, is of a different material, probably apocynum fiber. The strands are more evenly twisted and the braiding so done as to give the finished rope a very smooth appearance. It is also more flexible than the others, and shows signs of considerable use. It was broken or cut into three sections when found. Attached to the loop of the noose is a fragment of coarse netting made of soft fiber string. Fastened to the netting at several points is a thread-like fiber string.

Tied to the noose of each of the first two specimens described is a short piece of twine, and a bit of netting made of similar twine was found loose in the cache. Attached to one end of this netting are four beads and a little pendant of a material resembling opal, very brilliant in the proper light. Of the beads, the one next to the pendant is of white stone and measures $\frac{1}{8}$ of an inch in diameter, and $\frac{1}{16}$ of an inch thick. It is very symmetrical. Another white bead of the same material is a thin disk. The third and fourth are discoidal in shape and $\frac{1}{4}$ of an inch in diameter; one is made of a green stone, the other of shell, *Spondylus calcifer*.

The use of snares of this kind is not confined to any one region, but appears to have been general where game, such as deer, antelope, or mountain-sheep, was found. The Pomo Indians employ a similar contrivance, the noose, when set, filled with coarse netting.

[1] 1919, p. 45.

Lumholtz describes and figures a snare used by the Huichol Indians of central Mexico, which is set with a netting across the noose opening.[1] Waterman illustrates a Yahi deer snare of the same type as those under discussion, but without the netting.[2] It is probable that the Cliff-dwellers also used snares, as one of a series of pictographs found near Ruin 5 by the 1914 expedition depicts a man in the act of throwing a noose over the head of a mountain-sheep.[3]

The netting with which the noose was filled no doubt made the trap more effective, as it could be set to cover a much wider space in the runway. The animal in pushing its way through the net would draw the noose tight about its neck.

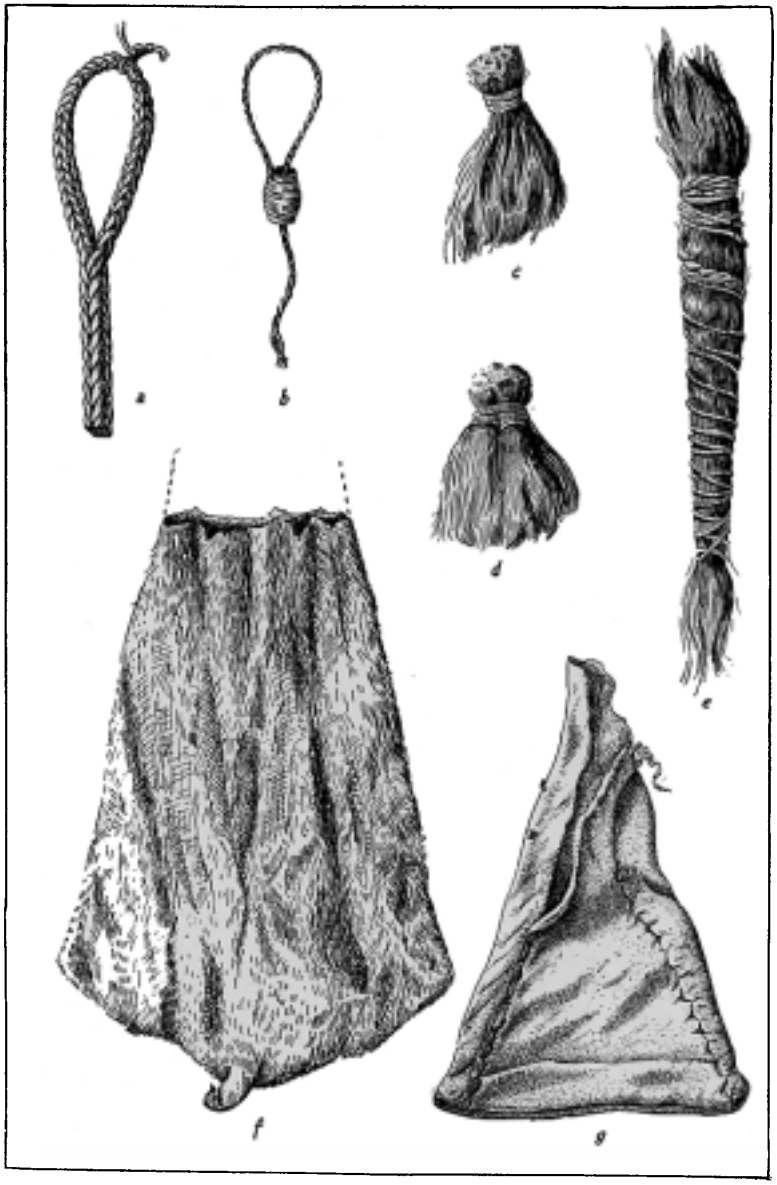
The method of braiding a rope square is also widespread and has survived into modern times as in Navajo leather riatos. Examples are found principally in regions where the lariat is used, though the Northwest Coast tribes braid ropes in this way for their harpoons and other fishing devices, as do the Mohave for neck strings.

A running noose probably designed for a snare is the clever little device illustrated in plate 32, b. The braided loop is replaced by a short section of hollow bone, neatly cut and seized to one end of the string with sinew. This makes a very free-running noose.

OBJECTS OF WOOD

Atlatl or Spear-thrower. The atlatl is a device which serves to add greater length, and therefore, greater propulsive force to the arm of the thrower in launching a spear or dart. It consists of a long, thin stick with a grip for the hand at one end, and a hook-like spur to engage the butt of the spear at the other. In throwing, the butt of the spear was placed against the spur at the end of the atlatl; its shaft lay flat along the atlatl with its point projecting in front of the user's hand; it was held in this position, probably near its middle, by the second (fore) and third fingers which passed through the loops of the atlatl on the sides of the grip. The fourth and fifth fingers were clenched upon the atlatl grip below the loops, holding it firmly against the palm and heel of the hand. The base of the thumb served to solidify this grip on the atlatl,

[1] Lumholtz, 1903, Vol. II, p. 41.
[2] Waterman, 1918, plate 13.
[3] Kidder-Guernsey, 1919, plate 93, b.



a, b, Snares showing details; c, d, e, Bunches of human hair; f, g, Skin bags.
b, c, d, f, g, White Dog Cave; a, Cave 6; e, Cave 14. (About ½.)

and the thumb proper aided to steady the spear in its resting place between and upon the second and third fingers.[1]

The atlatls illustrated in the plate were all found with burials in White Dog Cave. The finest of these, plate 33, b, c, had been broken nearly in two before it was placed in the cist. It is made of oak, carefully worked down and almost polished. The length over all is 25 inches. The front or spur side is nearly flat, except for the short distance between the spur and the distal end, where the middle is a little higher than the rest of the surface. The sides are rounded and the back is slightly convex. The distal end terminates in a blunt point. The spur is set at the head of a short deep groove, the bottom and sides of which show plainly the marks of the sharp stone tool used in excavating it. At $3\frac{1}{2}$ inches from the rounded proximal or hand end the two sides of the stick have broad notches; these notches lie between the finger-loops. The latter are made of a single strip of heavy dressed hide folded lengthwise. Through the middle of this folded piece there is cut a longitudinal slit just large enough to allow it to be pushed up over the atlatl shaft to its proper position at the lower end of the side grooves. The two flaps are brought forward and down until they touch the stick at the upper end of these grooves, where they are securely fastened with strong sinew sewed through them, and then wrapped around the shaft. On the back of the atlatl there is a thong which is looped through the slit in the grip, brought forward and seized to the shaft; this served to hold the strip in place and to keep the finger loops properly extended.

Tightly lashed to the back of the atlatl, as shown in the drawing, are three beautifully worked greenish stones of elongated loaf-shape, flat where they lie against the wood, their upper sides sharply convex. All three are fashioned from a substance identified by Professor J. B. Woodworth as a fossilized mammalian tooth.[2] The entire shaft, from the binding which holds the upper stone to the finger-loop attachments, is coated with a thin layer of resinous gum, applied before the stones were tied on, but afterwards renewed on the front side, where it covers the seizing of the middle one.

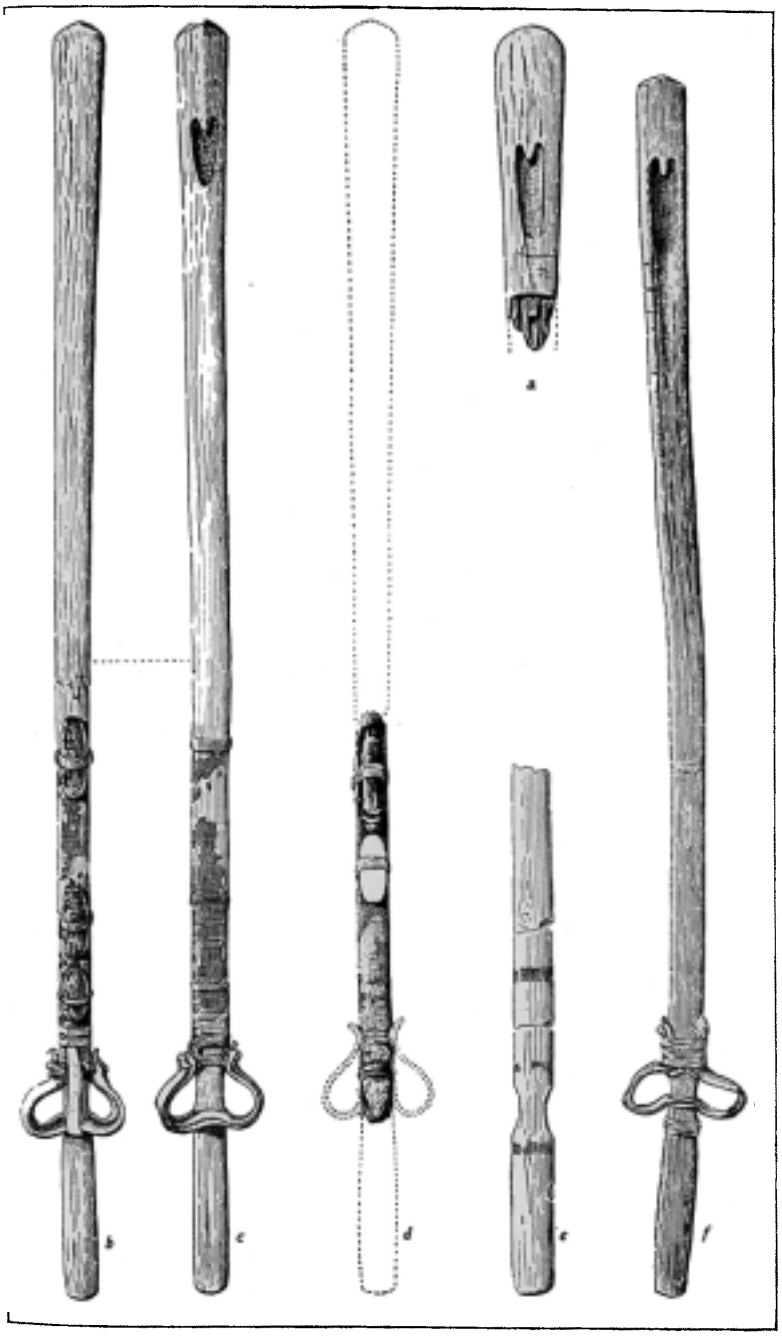
[1] See Kidder-Guernsey, 1919, figure 87.

[2] An unworked fragment of the same material was found in a bag in Cave 6; see plate 44, b.

The second atlatl (plate 33, f) is somewhat less well-preserved, its oak shaft being checked and a little shrunken, and the finger-loops dried stiff. The lateral curve of the stick is probably due to warping. The total length is 23½ inches. The spur is slimmer and sharper than that of the specimen just described; and the groove, instead of being deep and short, is shallow and runs nearly 5 inches down the shaft. The finger-loops are straddled as before, over a pair of broad notches in the side of the stick; they are made by folding a buckskin strip, slitting it in the middle, and drawing it over the shaft, to which the ends are attached by a cross-binding and an over-wrapping of sinew. The slit middle part is kept from slipping backward by an annular seizing. Ten inches from the butt there may be seen on the front (illustrated) side of the weapon the print of a former ligature; on the back there is a light colored oval mark corresponding exactly in size and shape to the flat base of a chipped stone (plate 35, f) found loose in the same cist. These traces indicate, of course, that the stone was once attached to the back of the weapon.

The next atlatl to be considered is a fragmentary one, shown in plate 33, d. The part recovered is a section of the shaft 7¾ inches long extending forward from the former seat of the finger-loops. To the back is attached an elaborate series of " weights." The specimen was found, done up with other objects, in a skin container that was tucked between the outer coverings and the fur cloth robe of mummy 2, Cist 24. Both ends are bruised and rounded, indicating that the piece was used in some way, perhaps as a ceremonial object or as a fetish, for a long time after the original weapon was broken.

In size and shape the fragment differs little from corresponding parts of the atlatls described above. The side grooves under the missing finger-loops are shallower; and there are a pair of notches just forward of these, which once held the fastenings of the front ends of the loops. Of the attached " weights," the lowest is a small triangular chipped point, 1⅜ inches long and ⅝ of an inch wide; its lower side is flat, so that it fits snugly against the stick, the upper side is somewhat rounded. The sinew wrappings which hold it pass about the shallow finger notches. Two and three-quarters inches above the chipped point there is a flat oval piece of white limestone, 1⅜ inches long, ½ inch wide, and ⅛ of an inch thick;



WHITE DOG CAVE
Atlatls or dart-throwers. (About ¼.)

it is very neatly made and is well polished. Almost touching this is a polished, loaf-shaped piece of dark green satin spar, 2 inches long. Pushed under the sinew binding that holds the latter in place is a section, 1 inch long, broken from a round skewer-like bone object, perhaps from a pin such as was used in making hair ornaments (plate 18, b). A dark, pitchy stain covers that portion of the shaft to which the objects just described are attached, and is smeared over the sinew wrappings of the two forward ones. Adhering to the stick when found were some downy feathers, but it is not certain that they had not become stuck to it accidentally.

The two remaining figures of the plate show pieces of broken atlatls. The butt fragment has two narrow notches on one side below the finger-grooves, a feature not observed in any other specimen. Ligature prints of the finger-loop attachments, and also of a " weight " binding may be seen. The broken distal end is the heaviest and broadest one in the collection; it measures $1\frac{3}{8}$ inches across; the groove is $2\frac{3}{4}$ inches long.

Darts. The darts cast with the aid of the atlatl consisted normally of two parts: a long main-shaft, feathered at the proximal or butt end; and a short foreshaft set into the tip or distal end of the main-shaft. Heretofore there has been little accurate knowledge as to the main-shafts, the material recovered having been very fragmentary. The expedition of 1916, however, yielded three nearly perfect specimens, as well as a number of less complete ones, from which additional details can be learned. These were all found with burials, and had, on account of their length, been broken before being placed in the cists.

The three entire shafts referred to above were in halves when discovered; mended they measure exclusive of foreshafts, $52\frac{1}{2}$, 55, and $55\frac{1}{2}$ inches long. The tips or distal ends are the heaviest parts averaging $\frac{1}{2}$ inch in thickness; from this maximum diameter there is a gradual taper to the butts or proximal ends, which average $\frac{3}{8}$ of an inch through. They are made of straight, slender branches of some light wood with a small pithy heart; the bark has been carefully removed, the twigs trimmed close, and in some cases the knots have been further eliminated by rubbing. The large ends of some shafts have a very slight terminal taper (plate 34, h), and the edges of the butts are rounded. One specimen has marks on

its surface such as might have been caused by using a shaft-straightener of the wrench type.[1]

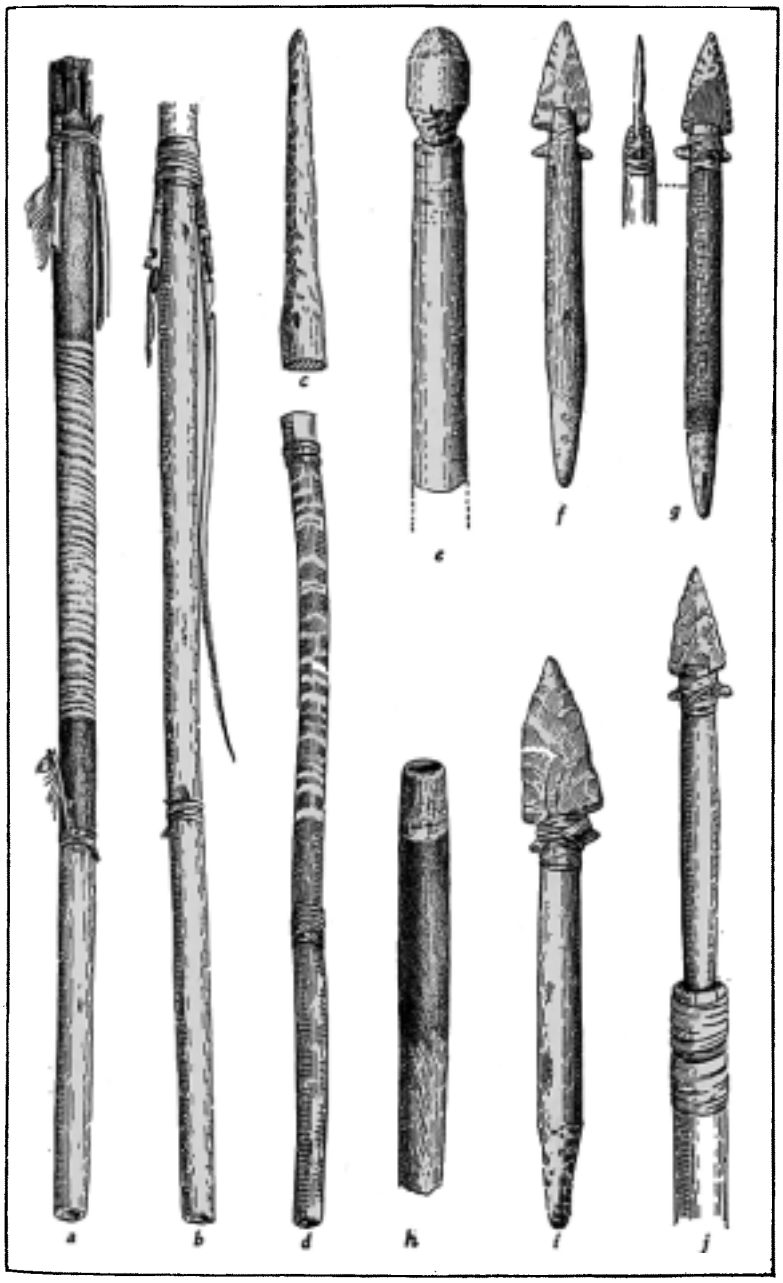
In the distal or large end of the shaft is drilled a cone-shaped hole $\frac{5}{16}$ of an inch in diameter at the mouth and 1 inch to $1\frac{1}{4}$ inches in depth; into this socket was fitted the butt of the foreshaft as in j. In order to prevent the socket from being split open when the foreshaft was driven back into it on impact, it is reënforced by outer ferrule-like wrappings of stout flat sinew as shown in the drawing. The proximal or butt end of the main-shaft is provided with a shallow cup, b, to engage the spur of the throwing stick, and here again there is sometimes applied a band of sinew to prevent splitting.

The method of winging the shafts can be accurately reconstructed from the material at hand. As shown in a, b, three feathers possibly somewhat trimmed, but with unsplit quills, were laid along the shaft and seized to it at both ends with flat sinew.[2] The average length of the feathers on five specimens is $7\frac{1}{2}$ inches; the average distance from the end of the feathering to the butt is $4\frac{1}{2}$ inches. The feathers themselves were prepared for attachment as follows: the end of the quill was cut off and into its hollow body there was introduced a tight fitting plug, 1 inch to $1\frac{1}{2}$ inches long, either of wood or of the sharp, hard tip of a yucca leaf. The end of the quill was further solidified by wrapping it about with sinew. Both these features are illustrated in b.[3] Heavy flat seizing of sinew secures the thus prepared lower end of the feather to the shaft; the light tip end has no extra strengthening and is merely bound to the shaft with a few turns of thin sinew. The purpose of this careful plugging and binding of the quill was undoubtedly to render it so firm and solid that it could be tightly bound to the shaft at exactly the correct angle; an unplugged quill would have been crushed by the ligatures, and the feather

[1] Though not uncommon in cliff-dwellings, we have found no such implement among Basket-maker remains. The Cliff-dweller wrenches are made of mountain-sheep horn, are 9 to 10 inches long, and have a hole, or a series of holes of different sizes, in one end; through these the shaft was drawn and then straightened by leverage on the other end (see Kidder-Guernsey, 1919, plate 46, a, e). See also Hough, 1919, plate 46, figure 4.

[2] We are now able to rectify an error in our previous report. In our restoration of the feathering of atlatl darts there given (figure 89) we were misled by the presence of some extra seizing bands not really connected with the feathering, and postulated a triple attachment like that on lower Yukon shafts. This is incorrect.

[3] Although we have not seen the specimens, we think it likely that the loose ends of cords bound under the seizing of the feathers on darts described by Pepper (1905, p. 121) represent the remains of feather-butt reinforcements similar to those just described.



WHITE DOG CAVE

a, b, d, Lower portion of darts showing method of feathering; c, Point of dart; e, Upper portion of dart showing bunt-head; h, Upper portion of shaft showing socket for foreshaft; f, g, i, Foreshafts with chipped stone points; j, Foreshaft in position, and upper portion of shaft. (About ½.)

would not have held rigidly to its intended position. The arrangement just described is, as far as we know, unique in shaft feathering, but is found in the feather hair ornaments of the Mohave (P. M. catalogue number 10091).

So little of the pile of the feathers has resisted decay and the ravages of insects that it is impossible to identify the species of birds from which they were obtained. Plumes of corresponding length and weight, tied into bundles and perhaps intended for the winging of darts, were found in Cave 1, Kinboko, in 1915 (Kidder-Guernsey 1919, plate 81; a, b); these belonged to Hutchin's (?) wild goose (*Branta canadensis hutchinsi*) and the western red-tailed hawk (*Buteo borealis calurus*).

A non-functional feature of the main-shafts remains to be described, namely, decoration. All the darts are painted or stained on the shaftment under the feathering, and also for a short distance back from the socket end; some, we judge from fragments, were colored their entire length. The most elaborately decorated shaftment (plate 34, a) is painted black with a spiral line of red; a second (d) was painted black over a temporary wrapping, which when removed left a spiral ornament in the light natural color of the wood. Another, on which the paint shows but faintly, seems to bear four broad longitudinal lines separated from each other by narrow stripes of natural surface. Most of the socket ends were painted black as shown in h, two, however, are red; and one socket end 25 inches long is stained black for 15 inches, thence to the break it is light red.

In the collection are a few broken main-shafts that have been put to secondary uses. The flint-flaker shown in figure 15, b, c, is mounted on such a fragment; another piece, from the butt-end of a dart, was whittled to a sharp point and served as a skewer-like pin for fastening together the wrappings of a mummy.

Foreshafts, complete with points, are represented by five perfect specimens from White Dog Cave. All of these are tapered at one end to fit into the socket of the spear shaft, and are notched at the other to provide a seat for the stone tip. The one shown in i, plate 34, formed part of a bundle resting in the lap of a mummy in Cist 31; it is the largest in the collection.[1] It is made from a peeled stick unworked except at the ends. The point is of red

[1] See table of measurements at end of description.

jasper and is secured to the stick by a seizing of heavy sinew. The one illustrated in f, found near the right hand of mummy 2, Cist 27, is slightly tapered at the notched end. The red jasper point is firmly wedged in the notch; the sinew bindings were in place when the specimen was found, but crumbled away on exposure to the air. Specimens g, and j, lay at the foot of mummy 1, Cist 24. The latter is flattened on either side at the notched end; its head is of yellow jasper and is secured to the shaft by a neat seizing of fine flat sinew applied very tightly. The body of the shaft is painted with a thin grey wash; at the notched end on either side are daubs of thick dark red paint put on over the wrappings and also discoloring the base of the chipped point. The head of g, is worked from a thin spall of dark flint, the original surface of the flake showing on one side. It is fastened to the shaft with flat sinew. The shaft itself is colored with dark red paint which ends where the taper begins, showing that it was tinted after it had been inserted in the main-shaft of the dart.

MEASUREMENTS OF FORESHAFTS IN INCHES

	A	B	C	D
Total length	$6\frac{3}{4}$	$5\frac{5}{8}$	6	$5\frac{3}{8}$
Length of shaft	$4\frac{3}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{1}{8}$
Diameter of shaft	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{3}{8}$
Length of head	$2\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{1}{2}$
Width of head at base	1	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{4}$

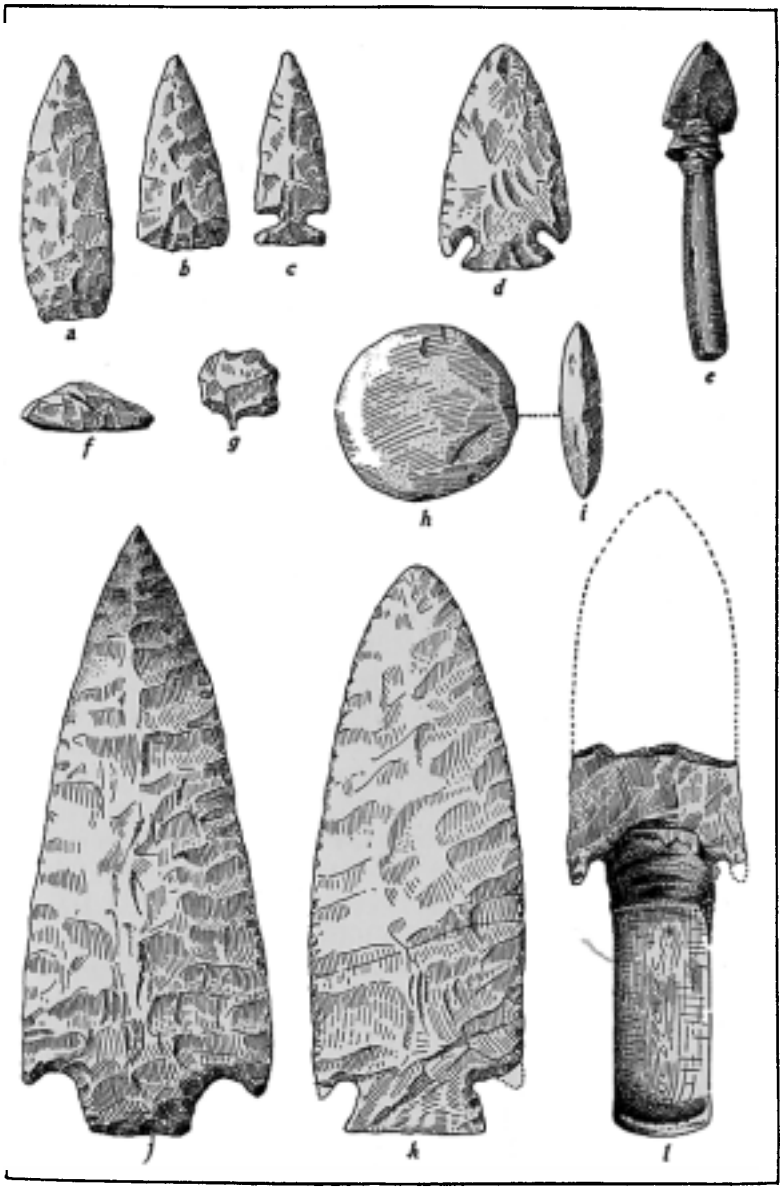
Comparing these with the dimensions of foreshafts from southeastern Utah given by Pepper (1905, p. 127), it will be seen that the latter average considerably larger.

On plate 34, e, is shown a wooden bunt head tightly wedged into the socket of the main-shaft, beyond the end of which it protrudes for $1\frac{1}{2}$ inches. The rounded end is $\frac{3}{4}$ of an inch in diameter. It is roughly finished and is much like a specimen figured in our first report, which we thought might possibly be a bunt head for an atlatl dart.[1]

Pepper,[2] illustrates several foreshafts with bunt heads of bone fitted down over them. Nothing of this sort is in the collection, but there is a main-shaft, c, whose distal end, instead of being provided with the usual socket, is brought to a plain tapering point.

[1] Kidder-Guernsey, 1919, figure 92 and p. 185.

[2] 1905, plate III.



a, b, Unfinished foreshaft points; c, Foreshaft point; d, Chipped knife blade; e, Hafted pipe-drill; f, Chipped atlatl stone; g, Chipped flint graver; h, i, Unfinished flint disc; j, k, Chipped knife blades; l, Flint knife (blade broken). a, f, h, i, j, k, l, White Dog Cave; b, c, d, g, Burial cave, Sayodneechee Canyon; e, Cave 6. (About ½.)

It is possible that a bone head was slipped on over this, and the foreshaft dispensed with.

Dart Points.[1] All the chipped atlatl dart heads which were found attached to foreshafts were of the tanged variety. From a skeleton in Sayodneechee Cave (1914), however, and in a little skin sack from Cist 6, White Dog Cave, were recovered a number of points similar in size and shape to the tanged specimens but with unnotched bases (plate 35, a, b). We believe these are dart heads completed up to the final step of flaking out the deep notches on the lower sides, a step deferred until just before mounting them in the foreshafts, because of the danger in an unmounted condition of breakage of the long and delicate flanges. Almost all our finished points are notched at right angles to their long axes, the notches having a depth equal to about one-third of the total width of the base. The notches of the large chipped knives, on the other hand, instead of being set at right angles to the long axes of the specimens, run in at an acute angle (compare the specimens illustrated in the two plates, 34 and 35).

Atlatl Stones. On plate 35, f, is illustrated a chipped object thought to have been originally fastened to the back of the atlatl shown in f, plate 33, which was found in the same cist with it (Cist 24, White Dog Cave). The material is translucent quartz; in shape it resembles a diminutive " turtle-back " with one flat surface. On the upper, or convex, side are faint marks that appear to have been made by wrappings.

Four small loaf-shaped stones were taken from the bottom of Cist 27. Though somewhat smaller than those fastened to atlatls b and d, plate 33, they are of about the same shape and were without much doubt atlatl stones. Each of them has one side flattened to fit snugly against the atlatl shaft. Three are made of a green stone somewhat the color of, but less hard than, jade; the surface of one is polished, the other two are roughened as if by some chemical action, but retain traces of an original polish. The fourth stone (plate 17, f, g) has rather more pointed ends and differs further from the others in having a deep concavity cut in the under side; it is made from an unidentified fossil and the surface is unpolished.

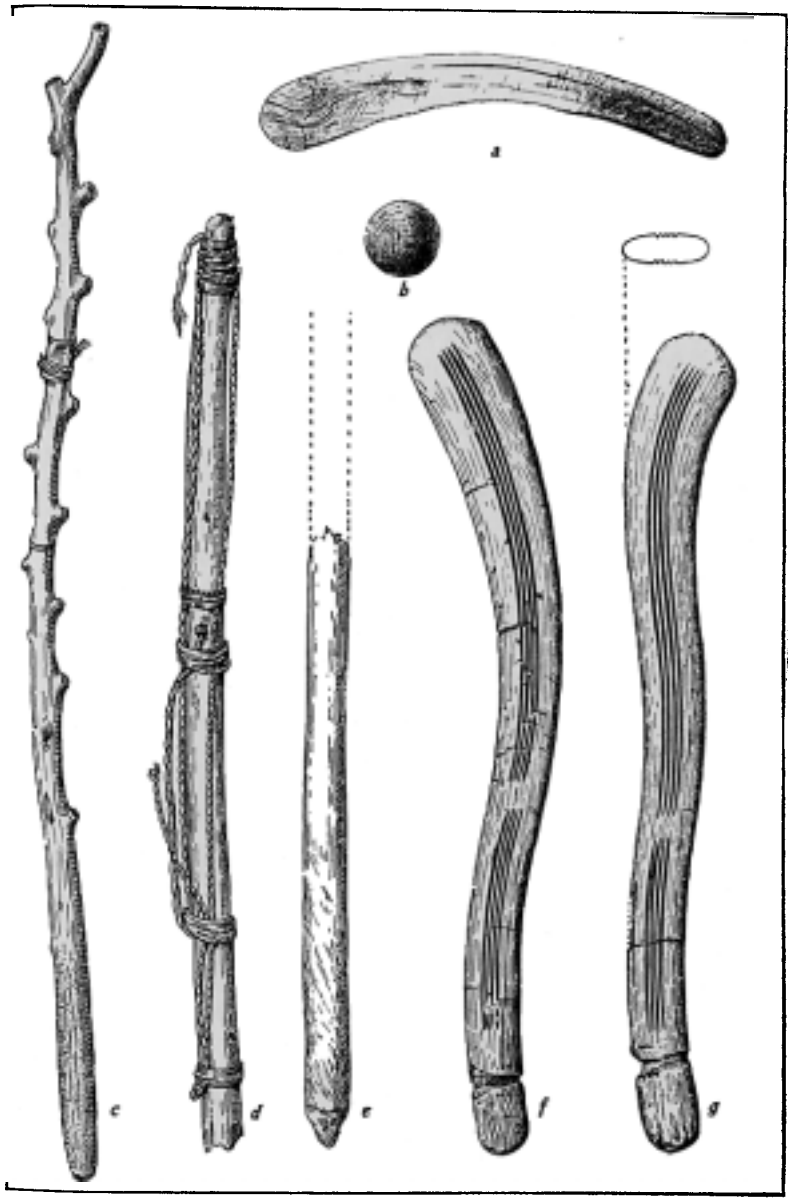
[1] These and the following specimens (atlatl stones) are treated here, rather than under their proper place among the stone objects, because they are really integral parts of the atlatl.

Another specimen is perhaps an unfinished atlatl stone; parts of its surface show chipping, others grinding. The material is the same as in the group of three described above.

Grooved Clubs. On plate 36, f, g, are shown two of these objects. The collection contains four complete specimens and one fragment. The former are from burial cists in White Dog Cave, and the fragment is from a looted and partly burned-out burial cist in Cave 6. The best preserved of these is one of a pair found with the mummy of an adult male in Cist 27. It is 20½ inches in length, 2 inches wide at the broad end, and tapers to 1½ inches in width at the small end; the average thickness is ⅝ of an inch. The warping of the stick may be partly accidental as it will be noted that the two specimens figured are not bent in the same direction. The edges and broad surfaces are rounded (see cross-section of the one illustrated in g). On each side are four deep parallel longitudinal grooves 17 inches long, with a break at one point as shown in the drawing. These grooves are neatly made, evenly spaced, V-shaped cuts. Two inches from the small end the club is ringed by a deep groove, set at a slight angle and widened at one edge to a broad curved notch; in the groove are traces of cord or sinew wrapping. A cement-like substance, thickest about the edge of the notch, still adheres to one side of the stick, and seems to have been put on over the wrappings. It is possible that the groove and notch may represent a seat for a wrist cord. There are two other much shallower encircling grooves, one 4 inches, the other 5¼ inches from the small end; in these also are marks of wrappings. All surfaces of the club show careful finish, but no traces of paint, the only color being a thin red line in one of the grooves which is probably a print from a wrapping cord. The edges and ends of the stick are not bruised or battered. Because of age and partial decay the club now weighs but 2½ ounces, but an undecayed fragment from Cave 6 shows the original wood to have been dense and heavy.

The foregoing description will answer for all the clubs in the collection, as they show little individual variation. While we can assign no specific use to these objects, we do not think they are rabbit-sticks such as those used among the Pueblo tribes.[1] Most of the latter differ from these in some details, particularly the

[1] Mr. C. C. Willoughby has suggested that they may have been used to ward off spears after the manner in which the natives of one of the Solomon Islands use an odd-shaped club for fending off spears, and also as a weapon of defense.



a, Wooden implement; b, Wooden gaming ball; c, Ceremonial stick; d, e, Opposite ends of wooden device; f, g, Grooved clubs accompanying atlatls. All from White Dog Cave except a, which is from Cave 14. (b, about ½; a, c–g, about 1/5.)

familiar type used by the Hopi, which in addition to having a hand grip cut at one end, is as a rule decorated by a painting with a prescribed design, one element of which is a pair of black markings symbolizing rabbit ears or rabbit feet. An ungrooved rabbit-stick, 6 inches longer than our grooved clubs but somewhat resembling them in shape, is in the Peabody Museum. It was collected by Dr. Edward Palmer in 1875 from the Diegueño Indians and is catalogued as a "boomerang." Clubs identical with our specimens were found in a pit-shrine near Laguna, New Mexico, by Mrs. Parsons,[1] and Hough figures one from a cave near Lava, New Mexico.[2] In the Peabody Museum are fragments of two grooved clubs from Yucatan which differ from ours only in that the broad surfaces and the edges are flat instead of rounded, and that there are a greater number of the parallel grooves. The sculptures of Chichen Itza frequently depict these clubs, usually in the hands of warriors who also carry atlatls and atlatl spears. One is figured most realistically on the sculptured top of an altar in the outer chamber or vestibule of the Temple of the Tigers, where it is shown in the left hand of a warrior, who bears as well an atlatl and sheaf of spears.

In company with all the grooved clubs noted either atlatls or some adjunct of the atlatl were found. The significance of this is two-fold; first, that it aids in establishing the identity of the Laguna pit-shrine and Lava cave specimens as Basket-maker; second, that it shows these clubs to be a distinct type used by a people who also used the atlatl. That the Laguna clubs were found with other offerings most of which were feather sticks of relatively recent make does not, to our minds, affect the question of their antiquity; the probable explanation of their presence in the shrine being that they were found in a Basket-maker cave by some Pueblo Indian who regarded them as appropriate offerings for the same reason that ancient arrow points are still prized by the Pueblos as fetishes. This seems all the more likely as the Zuñi are said by Mr. Cushing to have recovered baskets from prehistoric deposits.[3]

Planting Sticks. In plate 37 is a series of planting sticks: numbers a, c, d, and g were found in Cist 24, White Dog Cave; e and f are from Cave 9.

The one shown in g, we regard as a type specimen of Basket-maker planting stick; it is 45 inches in length and is made from a

[1] Parsons, 1918, figures 36, 38, 39. [2] Hough, 1914, p. 19, figure 21. [3] Ibid., 1919, p. 267.

root of some hardwood tree, possibly oak. The whole surface has been smoothed by grinding, but very little altered in shape. The smoothing process has removed all bark except that in the deep depressions such as occur in roots. One end has been worked down to a thin blade having a rounded point and one sharp edge. The blade is 2 inches in width and begins 17 inches from the end of the stick. It has a smooth, almost polished surface. The crook at the proximal end is natural, but it gives the implement a nice balance when held in position for use. This specimen shows long service.

The sticks represented in e, f, differ but little from the one just described. Both are made from roots; f, is 42½ inches in length and has a very thin blade with one sharp edge; e, is 32 inches in length with a blade 2⅜ inches wide, sharp on the end and curved edge.

The Cliff-dweller planting sticks which correspond to these in form are much lighter in weight with thinner blades, and nearly straight, carefully shaped handles that normally terminate in round knobs.[1]

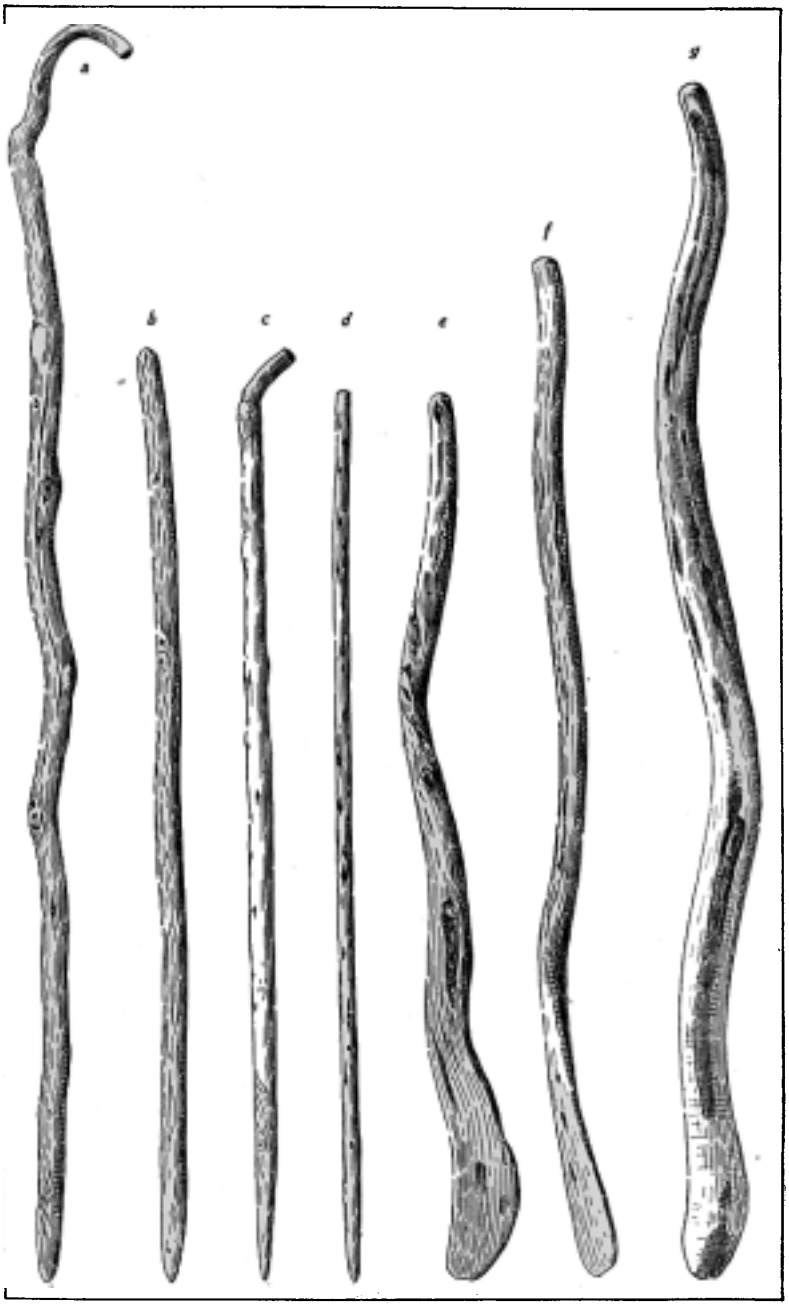
The one figured in a, found with mummy 1 in Cist 24, is of a different type, having a plain flattened point instead of a thin-edged blade; it is 49 inches in length and averages ⅞ of an inch in diameter. One end is worked down to a flat point, the other end has an artificial crook. It is made from a peeled limb of some hard wood. Knots are rubbed down and smoothed. This stick is dark in color and polished for its entire length by handling and wear.

The specimen shown in b, from Cist 6, White Dog Cave, is made from a heavy greasewood stick; it has a flattened point like the one just described. Simple sticks of this nature are also common in cliff-dwellings, and are used today by the Navajo.

The implement, c, is made from a rather light wood and has a neatly tapered point; the crook at the small end is partly natural; d is 32 inches long and is made of a slender greasewood stick; it has a long finely tapering point. The entire length of the implement has been smoothed and rounded. The point is slightly polished.

Scoop-like Objects. Wooden objects similar to those represented on plate 38, g, h, i, were found so regularly in Basket-maker

[1] See Kidder-Guernsey, 1919, plate 47, d, e; the stick shown in plate 47, c, we now think is probably Basket-maker. It was found with a disturbed burial in a small cave in Sagi Canyon.



Planting sticks. All from White Dog Cave with the exception of e and f, which are from Cave 7. (About 1/7.)

caves that we came to regard their discovery in the preliminary examination of a site as an indication that other traces of Basket-maker occupancy would be found. For this reason they are given a more detailed description than their commonplace appearance might seem to warrant. All of them have very much the same general form as those illustrated; this seems due to selection rather than to shaping as they are simply wooden slabs from small logs, the outer or convex surface natural, the inner side and ends usually charred by fire. From this and their appearance as a whole, we judge that they were merely unconsumed pieces of firewood, selected, as before stated, on account of their shape. A few, however, show no burning, being shells of wood rifted from the outer part of a timber, then ground at the ends to the required length.

One unvarying feature of these objects is their worn and rounded edges; we once used a similar piece of wood to scrape the loose sand from a cist and found that the edges soon became worn in the same way; for this reason we are inclined to think they were employed principally for digging cists. They were, no doubt, found useful for other purposes, as one in the collection has a quantity of caked yellow pigment adhering to its concave side. Apparently it had been used as a palette. Such slabs might also have served as rude food trays, and possibly for beating and shredding grass, a guess that we hazarded in our first report. Still another possible function for these objects might have been transferring hot stones from the fire to cooking baskets, in which case they may have been used in pairs. Though all those found were not saved the collection contains nineteen pieces ranging in size from $5\frac{1}{2}$ inches long and 3 inches wide to $18\frac{1}{2}$ inches long and 6 inches wide, the average dimensions being 7 inches long and 4 wide, a convenient size to use in the hand.

Hough figures "a shell of wood" from Tularosa cave which resembles the implements just described;[1] while another from the Mesa Verde apparently identical with ours is figured by Morris.[2]

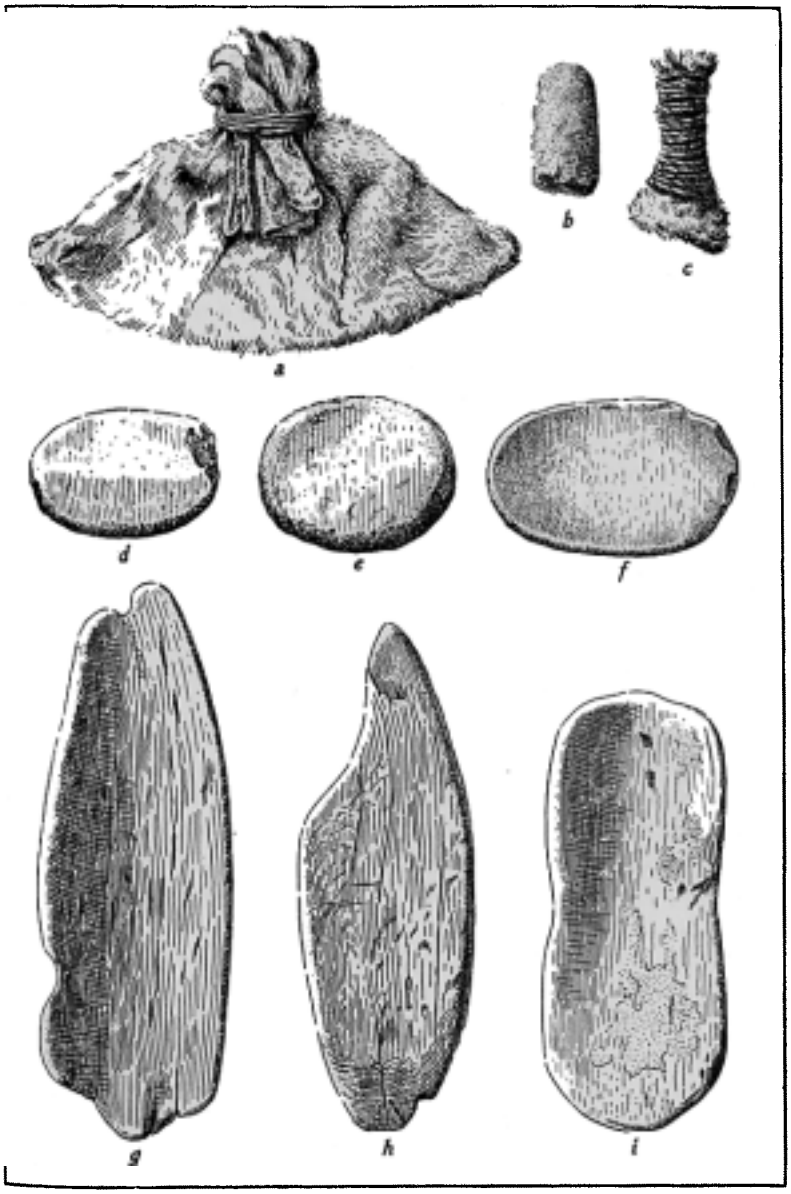
Curved Wooden Tools. Our two specimens are so closely similar to each other that it is probable they represent a definite type. The better preserved example (plate 36, a) is a piece of very hard, close-grained wood, 12 inches long. Its pronounced curve is apparently natural, but all its surfaces have been worked down by

[1] Hough, 1914, plate 14, figure 2. [2] Morris, 1919, a; plate 44, e.

whittling or scraping. One end is almost round, the other much thinner. The middle part of the concave side is worn to a slim rounded edge and is highly polished by long use. The two ends are stained dark by much handling. The object was obviously held by the ends and worked toward the body like a modern drawknife. The unscratched condition and high polish of the concave edge shows that it must have been used on some non-abrasive substance. Its curve fits the thigh so well that we have thought the implement might have been employed in some way for dressing or suppling hides held over the knee.

The second specimen, though a trifle longer, is of the same shape and bears the same polish on the inner edge.

Other Objects of Wood. On plate 41, a, is illustrated a pair of slim worked twigs, $7\frac{1}{2}$ inches long and $\frac{3}{16}$ of an inch in diameter. The two are held together by a string tied in little grooves that encircle their lower ends; this is evidently a permanent attachment but it is loose enough to allow the two sticks to be spread apart. An adjustable tie was evidently used at the upper end, for there only one twig is grooved and the other has a small hole drilled through it. A string is made fast to the grooved stick; its loose end was undoubtedly passed through the hole, pulled tight and made fast when it was desired to close the pair together and hold them in place. A number of similar objects are in the Grand Gulch collection in the American Museum, New York (H–13180 and H–13267); these sticks are also tied permanently together at their lower ends, and have a loose-ended string set in a groove at the upper end of one of them. The other stick, in each of the New York pairs, has a little string loop instead of the drilled eye of the example here illustrated. All these specimens were evidently designed to be clamped over and made fast about objects 6 or 7 inches wide and not over $\frac{1}{4}$ of an inch thick. As to what such objects might have been we are entirely ignorant. A wooden awl about 6 inches long, made from a peeled greasewood stick, was found; the butt is cut off square and the other end is whittled to a sharp point. For a variety of other specimens made wholly or in part of wood, see under "Ceremonial Objects."



a, b, c, Skin bag and contents; d, e, f, Manos or grinding stones; g, h, i, Wooden scoops.
a, b, c, Cave 14; d–i, White Dog Cave. (About ½.)

OBJECTS OF STONE

Manos. These are intimately related to the domestic life of corn-growing Indians, and in a measure furnish an index to their progress as agriculturists. The manos of the more highly developed tribes, such as the Pueblos, show a tendency towards specialized forms; while those used by people of less firmly established corn-eating habits are as a rule stones of convenient shape with little or no alteration of the original form other than that due to wear. Basket-maker manos belong to the latter class. Three typical examples from White Dog Cave are reproduced in plate 38, d, e, f.

The latter is $5\frac{3}{4}$ inches long, $3\frac{1}{2}$ inches wide, and $1\frac{1}{4}$ inches thick. It is made from a thin slab of indurated sandstone the edges roughly worked down to give the implement an oval shape. Only one surface shows use, this is ground nearly flat. The one figured in d, is $3\frac{3}{4}$ inches long, $2\frac{3}{4}$ inches wide and $1\frac{3}{4}$ inches thick; it is a hard lava-like stone of natural shape. One side is much worn and has a convex surface; a small area of the top also shows signs of use. That shown in e, is slightly larger than the last and of the same material. The form shows slight modification and both sides are about equally worn.

In addition to the above specimens, there is in the collection half a mano of soft sandstone with edges pecked and ground to give it an oval shape. Both sides are much worn; one shows traces of a dark red, the other of a yellow color, presumably evidences of secondary use as a paint grinder. Another stone of about the same size but which is probably not a mano, is a rounded river boulder $4\frac{1}{2}$ inches long and $2\frac{1}{2}$ inches thick. A portion of either side bears a high polish quite different from the rough surface produced by grinding on a metate. This polish is obviously the result of long rubbing on a non-abrasive surface; work on hides or use in hulling seeds in a basket may be suggested.

Metate. A single broken specimen was found. Like the manos it is of a crude and unspecialized type, being merely a flat slab unmodified except for a hollow on one side, the width of which is the same as the length of the manos.

Chipped Knife Blades. One of these specimens (plate 35, j) was found at the right hand of mummy 2, Cist 27, White Dog Cave.

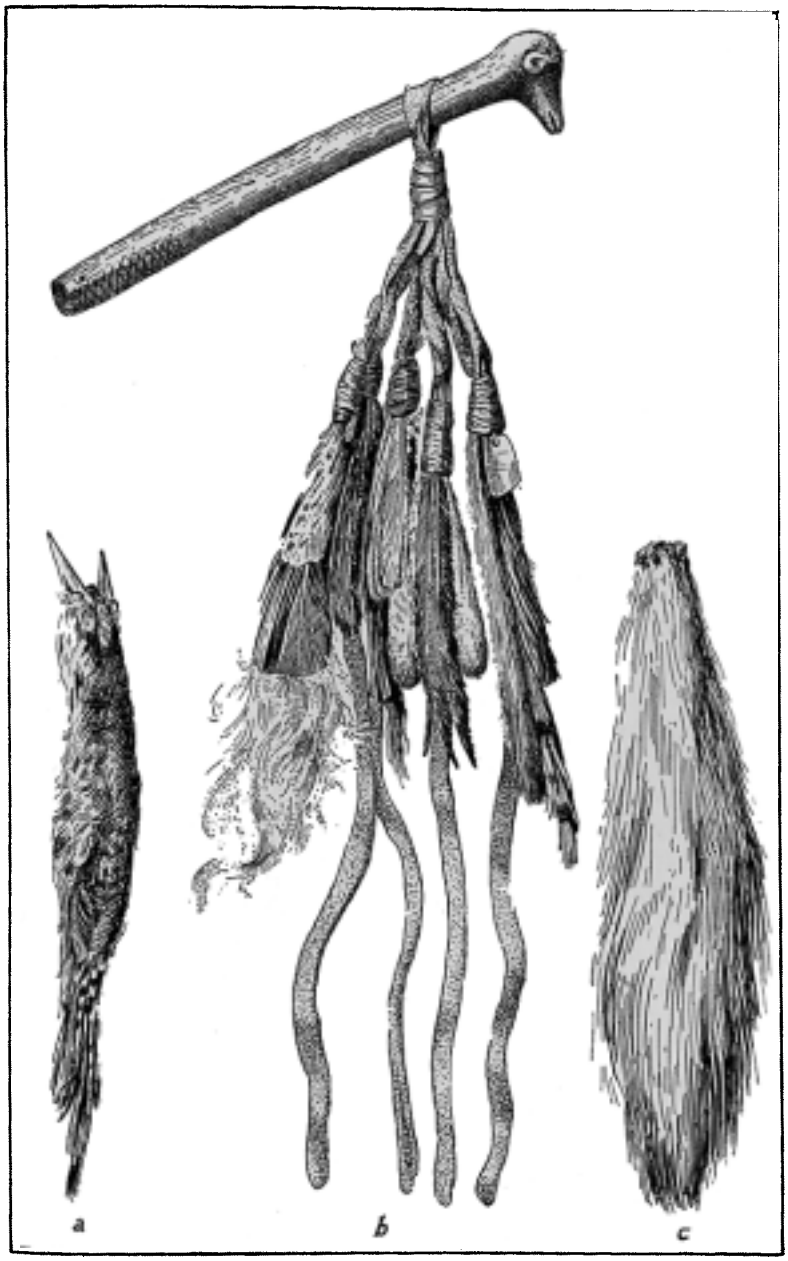
Its length is $6\frac{7}{8}$ inches, its greatest width is $2\frac{7}{8}$ inches, the average thickness is $\frac{1}{4}$ of an inch. The material is a mottled yellow flint. The point for $1\frac{1}{2}$ inches is a dark red which seems due to staining rather than being the natural color of the stone. It was reduced to an even thinness by the chipping off at regular intervals of long broad flakes, at so obtuse an angle that no central ridge is left, the face of the blade being slightly convex instead of angular. The cutting edge is keen, the result of fine secondary chipping. The stem is tapered to a wedge-shaped base.

The blade shown in k was found with mummy 3, Cist 22. It had been broken in two pieces before burial; the halves lay at a little distance from each other and one of them was discolored by some agency to which the other was not exposed. This blade measures $6\frac{1}{2}$ inches in length, $2\frac{1}{2}$ inches in width, and averages slightly under $\frac{1}{4}$ of an inch in thickness. The material is chalcedony. It differs but little from the first specimen, except that the end is rounded and shows signs of an attempt to grind away a slight protuberance that had resisted the original chipping. On the base of the blade are traces of the gum that once served to cement it to its haft. The latter was also found in the cist; and although it is badly rotted and shrunken, its notch still fits the blade. In shape it is a duplicate of the haft next to be described.

The workmanship of these two knives compares very favorably with that of similar implements from other parts of North America. In shape and general appearance they most closely resemble the large chipped knives of Mexico and Central America.

Hafted Knife. The specimen shown in plate 35, l, is from Cist 6, White Dog Cave. The blade, part of which is unfortunately missing, was probably once $4\frac{1}{2}$ to 5 inches long; it is 2 inches wide at the base and has a thickness of $\frac{1}{4}$ inch. The material is a close-grained white stone. The chipping of the portion that remains is rather coarse, though the notches and barbs show skillful flaking.

The wooden handle measures $3\frac{1}{4}$ inches in length, a fraction over 1 inch in width, and has an average thickness of $\frac{3}{8}$ of an inch. The lower end thickens considerably to allow for a notch $\frac{3}{4}$ of an inch deep into which the blade is set and there held in place with cement-like gum reinforced by a small wooden wedge and wrappings of pitch-smeared string. The handle is well-preserved and shows careful finish; it appears to have been made from a section of a small



WHITE DOG CAVE

Ceremonial objects: a, Stuffed bird skin; b, Wand; c, Deer tail. (About 3/5.)

limb worked down to shape by cutting away two surfaces; both the wide sides thus produced are slightly convex, while the edges are nearly flat. At the butt the handle curves and terminates in a neatly finished end, the peculiar form of which is duplicated in two other less well-preserved specimens; one of them is the handle of the large chipped blade, k, previously described. This type of butt may represent an individual whim, or it may perhaps prove to be a characteristic of Basket-maker hafts. There are a number of stone knives with plain handles from this general region in the collections of various museums; some or all of these may be Basket-maker, but unfortunately the data accompanying them leave doubt as to their exact origin. What are, however, surely Cliff-dweller hafts from Aztec, New Mexico, are described and figured by Morris,[1] and one from the Mesa Verde is illustrated by Nordenskiold.[2] Hoffman figures two modern Ute knives with plain handles.[3]

Pipe Drill. The chipped point shown in plate 35, e, is apparently an old darthead remounted in its present handle. It is of very hard, lustrous flint, $1\frac{5}{16}$ inches long, and $\frac{3}{16}$ of an inch in breadth at the base. Both edges are much worn down and beveled by long-continued boring, the plane of the bevels indicating clockwise rotation. The handle is a stick $2\frac{3}{4}$ inches long, $\frac{3}{8}$ of an inch thick, having one end rounded, and the other notched to provide a seat for the chipped point, which is held in place by a seizing of fiber string.

The wear on the point indicates clearly that this specimen was used as a drill, and the nature of the haft confirms this. Held in position for boring, the haft is found to be just the right length to bear against the palm of the hand at the base of the index finger; in this position the drill can be easily turned by the index and third fingers and the thumb, while pressure can be applied to the butt by the palm. The chipped point exactly fits the bores of the Basket-maker stub pipes.

No pipes were found in 1916–1917, but type examples are shown in figure 94, a, b, c, of our previous report.

Graver. A tiny stone tool, evidently designed for scratching fine lines on wood or bone, is illustrated in plate 35, g. It is an irregularly shaped jasper flake, less than an inch in diameter, and $\frac{3}{16}$ of an inch thick; the top is convex; the lower side is flat at one

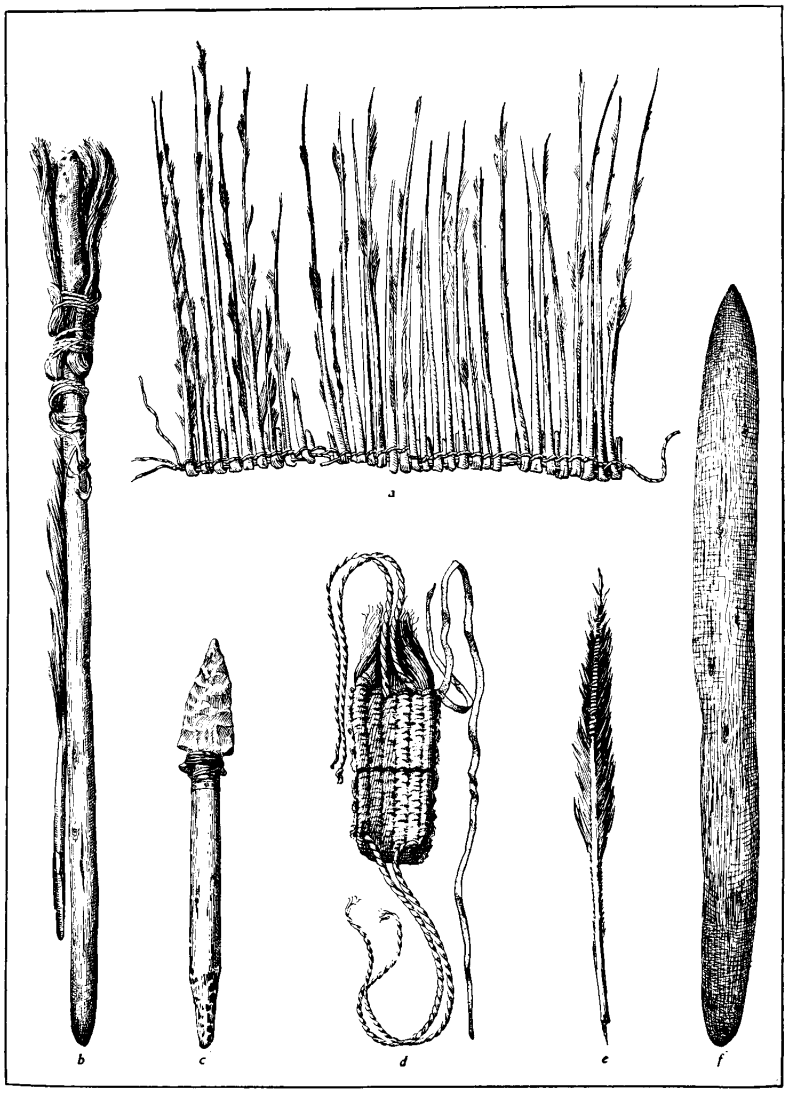
[1] 1919, p. 33 and figures 17, 18. [2] 1893, p. 97, figure 59. [3] 1896, figures 52, 53.

place where a small and very sharp point has been carefully chipped out. Such an implement as this must have been used to incise the clean-cut parallel lines seen on the curved wooden clubs figured on plate 36, f, g.

Flaking Tool. This implement (figure 15) from plundered Cist 6, White Dog Cave, is included here because of its intimate connection with stone chipping. So far as we know it is the only complete example of a prehistoric flaker of its type that has yet been found. It consists of an antler or very hard bone point mounted on a wooden shaft in the manner indicated in the drawing, which also shows more clearly than a description the shape of the point itself. The length of the latter is $3\frac{3}{4}$ inches, of which $\frac{5}{16}$ of an inch projects beyond the end of the shaft; the width appears to be uniformly $\frac{1}{4}$ of an inch. The projecting portion tapers to $\frac{1}{8}$ of an inch at the extreme end. The shaft is a piece of an old atlatl spear shaft 35 inches long. The bone point is bound to the smaller end of this by seizings of skin overwrapped with sinew. The larger end is worked to a rounded point, for the purpose, perhaps, of allowing it to be easily thrust into the sand to hold it upright while the workman was using other tools. In the middle are a number of turns of a wide thong of skin wound spirally about the shaft and running towards the working end. These are applied in two layers, one above the other; at the distal end they are held in place by a binding of sinew and there are signs that they once extended farther down the shaft than they do at present. These wrappings were probably cut from hide with the hair on it, although the fur has now almost entirely disappeared; their purpose will be discussed later.

There is no doubt that this implement was used as a stone-flaker. Pope figures a Yurok bone pointed arrow-flaker with a shaft $17\frac{3}{8}$ inches long, which is very similar to this specimen.[1] Rau illustrates another from Nevada which he describes as a slender blunt point of horn bound with cotton cord to a wooden handle about the thickness of an arrow shaft. According to the drawing the length of the latter is $29\frac{1}{2}$ inches.[2] Cushing gives a sketch of an arrowmaker using a long-hafted flaker, but provides no information as to the data on which the drawing is based, though he briefly describes the way the implement is used.[3] The following

[1] 1918, plate 27. [2] 1876, p. 96, and figure 340. [3] 1895, figure 6.

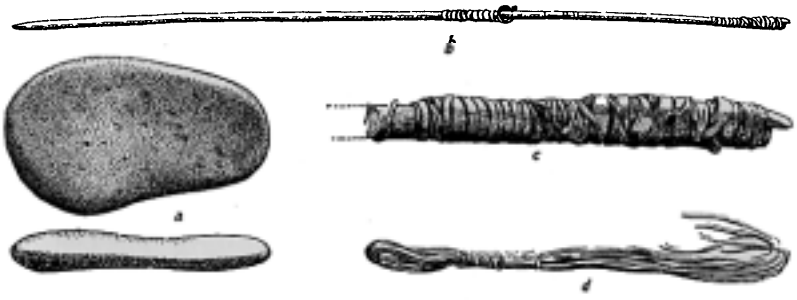


WHITE DOG CAVE

Objects forming bundle from lap of mummy (plate 7, b), Cist 31. (About ½.)

is Schumacher's description of the Klamath method of flaking: "The tool is worked with the right hand, while the lower part of the handle, usually ornamented, is held between the arm and the body so as to guide the instrument with a steady hand." [1] The foregoing makes clear the advantage of the long shaft, but does not point out the fact that the weight of the body can, by means of it, be brought to assist the pressure of the hand.

We can find no reference to padding of that part of the shaft that is held between the arm and body; such was undoubtedly



a, Flaking stone; b, Arrow-flaker of antler in wooden haft, much reduced in size; c, End of arrow-flaker; d, Package of sinew cord. All from White Dog Cave. (About ¼, with the exception of b.)

the purpose of the central hide wrappings on our specimen. A soft furry padding of this sort must have contributed greatly to the comfort of the user, particularly if his arm and body were not protected by clothing; and it probably helped also to secure a firmer grip than would be offered by the bare shaft.

Flaking Stone. The specimen shown in a, figure 15, is a small flat unworked stone, oval in outline, 3¾ inches long, 2½ inches wide and ½ inch thick. It is much like certain stones obtained in the Museum's explorations of ancient burial places in Erie County, New York, which were invariably accompanied by bone flaking implements as well as finished and unfinished chipped points and knives. The Museum collection also contains similar stones from Madisonville, Ohio,[2] and eastern Massachusetts. Mr. Willoughby has identified these stones as forming part of the flint worker's equipment. The stones from New York, Ohio, and Massachusetts are marked with scorings which are not present on this specimen;

[1] Quoted in Holmes, 1919, p. 312. [2] See Hooton and Willoughby, 1920, plate 6, l, m.

our tentative identification of this as a flaking stone is strengthened by the fact that it was found among the partly rifled contents of Cist 6 which also held the hafted flaking tool described above, as well as a small skin bag containing two nearly finished points, a number of flakes of flint and various colored jasper, a combination of objects exactly duplicating those found in the New York graves.

OBJECTS OF CLAY, BONE, ETC.

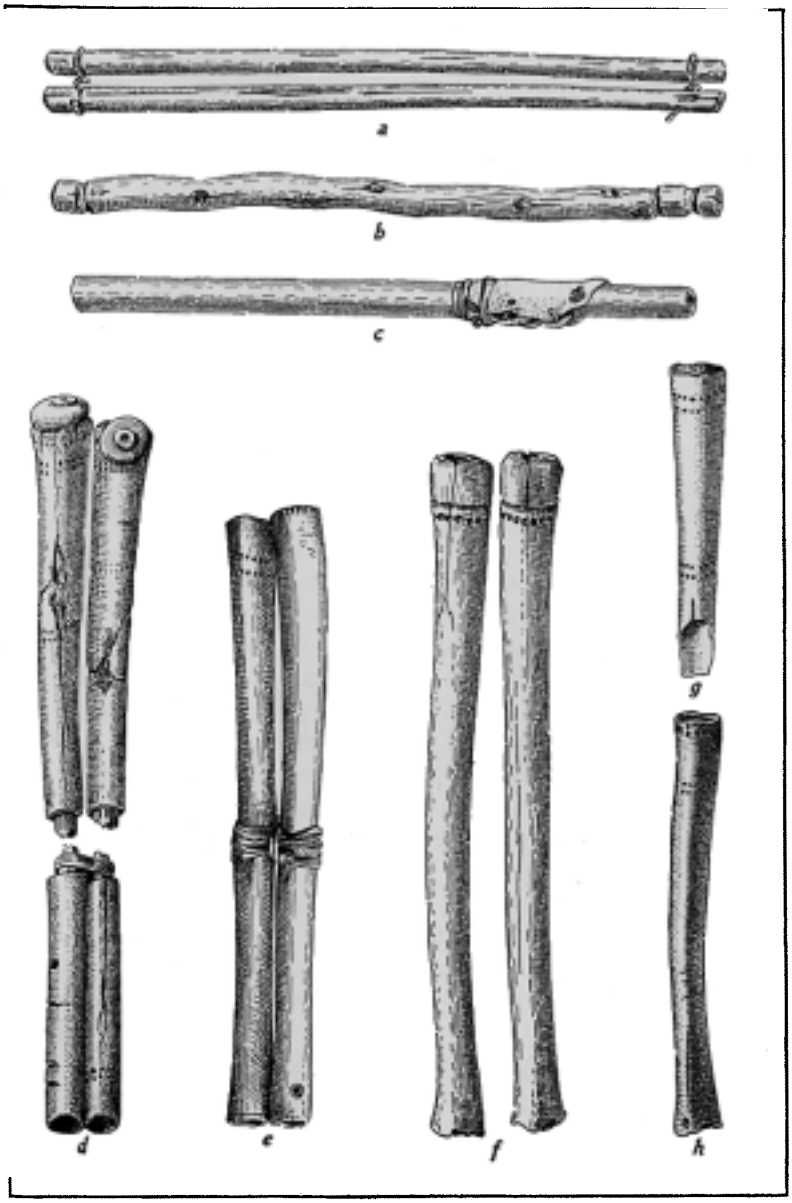
Pottery. No specimens of true pottery, either vessel or sherd, have yet been found by us under circumstances indicating that it was a Basket-maker product. All but one of the several jars discovered came from the surface sand overlying the Basket-maker deposits; they are of common cliff-house ware, and were undoubtedly cached in the caves at a comparatively late date. The exception is a pot found in Sunflower Cave in 1915, lying below a cliff-house floor. This was figured in our previous report and referred to as possibly of Basket-maker origin.[1] It is of plain black ware, uncorrugated; in shape it is almost spherical. No further evidence that the Basket-makers produced vessels of this type has since come to light, and we are inclined to consider it early Puebloan.

The only specimen that even remotely resembles pottery was found in Cave 6. It is a fragment from the rim of a shallow dish-like receptacle nearly $\frac{1}{2}$ inch thick, made of unburned clay heavily tempered with shreds of cedar bark. It was molded in a shallow basket, the print of which is plainly visible in the outer surface of the sherd (plate 25, a). The inner side is smoothed off, but has an irregular, wavy surface as if it had been done by the fingers. We do not know whether this specimen is merely a fragment of a clay lining put in a basket to render it watertight or fireproof,[2] or whether it really represents an early attempt at pottery making.

Bone Objects. Objects of this material described under other heads are: beads, flaker, decorated tubes, rattle handles, plain tubes, and whistles. This practically completes the list of specimens made of bone, the only others being a few awls (plate 42, e–h), and a pair of unworked cannon bones of the deer, found

[1] Kidder-Guernsey, 1919, plate 59, a, and p. 144.

[2] Cushing (1886, p. 484) describes a Havasupai roasting basket lined with clay. The present object may have been made for a like purpose, but it was certainly never so used, as bits of the cedar-bark tempering which protrude from the inner surface are not even scorched.



a, b, c, Objects made from short sections of sticks; d, e, f, Paired bone tubes; g, h, Bone tubes. All from White Dog Cave except f, which is from Sunflower Cave. (About ½.)

carefully wrapped up in a bunch of shredded cedar bark at the feet of mummy 1, Cist 24, White Dog Cave. These were probably selected and laid aside to be fashioned later into awls. No bone scrapers occur.

Dressed Skin. The skins of animals were much used: some as rawhide, some dried, and others dressed with or without the hair. Specimens of the latter were very finely dressed, being as soft and pliable as the best buckskin prepared by modern Indians. Deer and mountain-sheep skin robes have already been mentioned. The pelts of these animals were also extensively employed for minor purposes, as in cradle edge-bindings and back-lashings, in fur-string, and for all kinds of strong thongs. The skins of prairie-dogs, being light and soft-furred were always used as covers for infants' umbilical pads.

Bags of all sorts were made of dressed skin, from tiny pouches to hold a few little trinkets, up to large sacks for the storage of corn. Some have the hair on, others do not; but all are very carefully made, the seams neatly stitched with sinew or fine cord and turned inside. The most characteristic bags were produced by sewing together the trimmed skins of two or more prairie-dogs in such a way that the neck of the sack was formed by the heads of the animals, its mouth by their mouths.[1] In some cases as many as seven or eight hides were used.

Sinew. The many references in this report to the use of sinew bindings and seizings give sufficient evidence of its value to the Basket-makers. It was employed whenever a firm flat ligature was desired, as well as for thread in cases requiring extra fine and strong sewing. The kinds of sinew are, of course, not identifiable, but the bunch of it in its raw state shown in figure 15, d, appears to have been taken from some large animal.

Feathers. Feathers were used for the following purposes: in hair ornaments; in pendants; as edgings in fur cloth; for the winging of atlatl darts; and in the make-up of a variety of objects of unknown use which we have classed together as probably ceremonial.

[1] Kidder-Guernsey, 1919, figure 86.

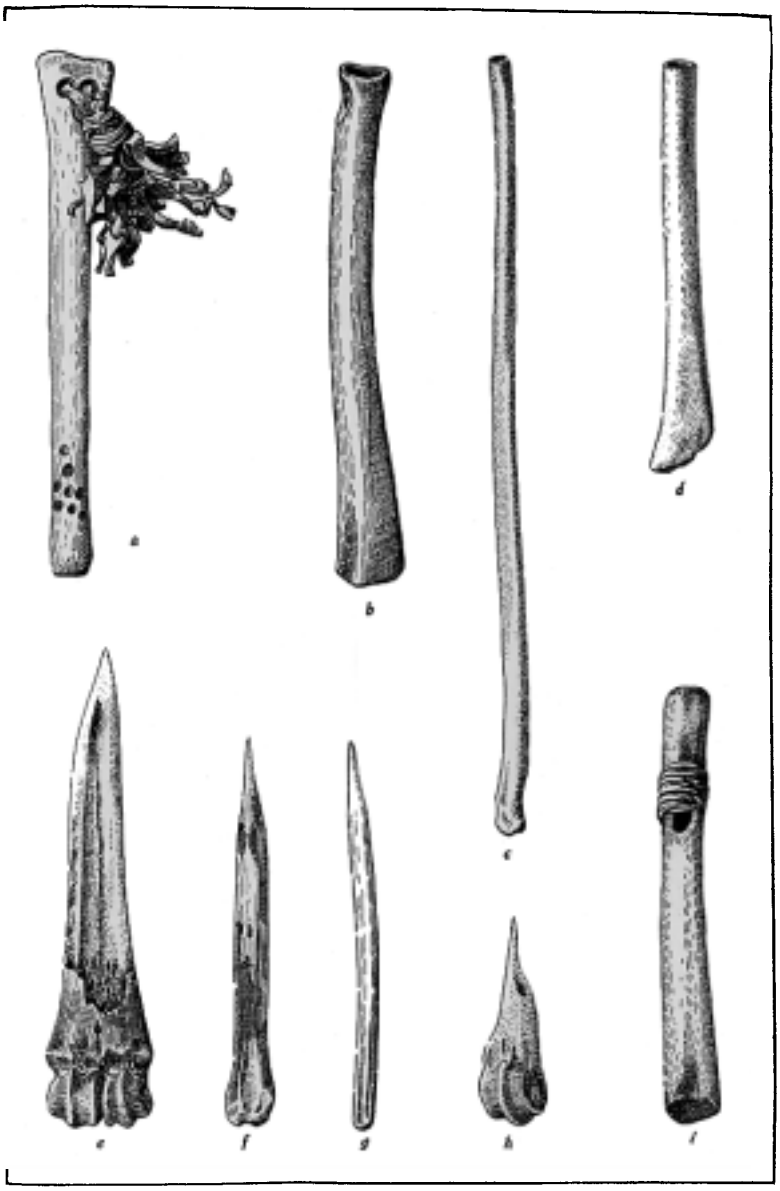
CEREMONIAL OBJECTS

In this section we have grouped all specimens to which we cannot assign a definite utilitarian purpose. The nature of many of them leaves little doubt as to their ceremonial or fetishistic use; as to others the case is less clear.

Ceremonial Whip. To one end of a thin, peeled greasewood stick about 20 inches in length there is bound a flat, three-strand braid of shredded yucca leaves, 8 inches long; to the end of this is tied a small bunch of the twigs of the plant called "Brigham tea"; the twigs are 10 inches long, so that the total length of the specimen is a little over a yard. It has the look of a scourge or whip, but its real use is, of course, unknown.

Problematical Objects. In Cist 27, White Dog Cave, were found a number of broken sticks tied together with string. On undoing the bundle it was found that the sticks were fragments of two singular contrivances, the use of which we cannot even guess (plate 36, d, e). One is complete, the upper part of the second is missing. They are slim cottonwood sticks about 7 feet long, their lower ends pointed, and the first foot or so of their shafts soiled and scarred as if they had been repeatedly thrust into gravelly earth. The arrangement of strings at the upper end of the complete specimen is better explained by the drawing than by description. It will be seen that there are two cords running downward from the tip. These are so arranged as to form two adjustable loops along the shaft, the knotted ends of the strings serving to keep these loops from being pulled out by whatever object they were designed to hold.

The object shown in c, is a hardwood branch $27\frac{1}{4}$ inches long. The bark has been carefully peeled and the butt end smoothed by rubbing. For a distance of about 4 inches from the butt the twigs have been cut off close to the main stem; thence to the tip they are also cut off, but their bases have been left long enough to give the object a knobby appearance. The ends of a majority of these protruding twig-stubs are merely ground down to a flat surface; but three, two of which show in the drawing, have neat, shallow, cup-shaped depressions worked in them. The lower four inches of the stick, from which, it will be remembered, the projecting twig-stubs were removed, is discolored and stained as if by having been



WHITE DOG CAVE

a, Handle for deer-hoof rattle; b, c, d, Bone tubes; e–h, Bone awls; i, Bone whistle. (½.)

thrust into damp earth or clay. A little above the middle are two sets of sinew bindings; under the upper one of these are remains of the quills of many small feathers arranged in two groups, one on either side of the shaft. We can offer no suggestion as to the use of this specimen.

Ceremonial Wand. The unique ceremonial object shown in plate 39, b, was found with mummy 2, Cist 24, White Dog Cave; it was wrapped in a bag made of prairie-dog skins, and lay between the right arm and side of the mummy under the fur-string robe which enveloped the body. Details that are not obvious in the drawing are as follows: the handle of wood has a length of $5\frac{1}{8}$ inches; the upper end is carved to represent the head of a bird; the eyes are formed by two small disk beads of shell stuck on with pitch. Adhering to the head about the eyes are tufts of the fine reddish hair of some animal. At the crown of the head there is a slight depression filled with hard gum or pitch in which are a few hairs like those at the side of the head. These may be the remains of a crest, or the result of accident. The appearance of the spot gives the impression that some object about the size of the disk beads which form the eyes, had at one time been fastened here. At the lower end of the handle its under side is embellished for a space of slightly over $1\frac{1}{2}$ inches with cross hatching of fine incised lines. All parts of the handle are nicely finished, and show, particularly at the lower end, a polish due to use. Attached to it by a thong loop are five pendent strings or streamers of thick soft-dressed skin; part of one of these is broken off, the remaining four are each 10 inches in length. These streamers are gathered together at the upper end and secured to the loop by wrappings of sinew. Bound to the upper end of each streamer by sinew seizings are tails of small birds and animals, and feathers. One streamer has five blue feathers, five small brown feathers, and one white and brown feather; the next, one long downy feather, one large dark-colored feather trimmed off at the end and several small brown feathers. The third has the quill ends of two large dark-colored feathers; these are cut down to a length of 3 inches, and placed parallel to each other with the lower ends fastened together by several tight turns of fine sinew; over these are laid a number of small bright yellow feathers; a strand of human hair 3 inches long completes the group. The fourth streamer has

fastened to it six feathers from the tail of some small woodpecker, and two prairie-dog tails. The fifth bears several blue feathers, one trimmed black-and-white feather, the tail of a small animal, the fur of which is about the color of mink, and a very pretty little abalone shell pendant.

The specimen just described, like a number of objects recovered from Cist 24, is in a nearly perfect state of preservation. Wrapped up with it was the small deer tail shown in c, the head of a sap-sucker (*Splegrapicus varius muchalis*)[1] a, and what appears to be the end of a bag made of badger skin dressed with the hair on. The bird head is stuffed with fiber or grass, and the tail feathers of the bird, tied together in a bundle, are thrust into the skin of the neck. A Pomo doctor's outfit in the Museum collection contains a number of bird heads stuffed with grass which remind one at once of this specimen.

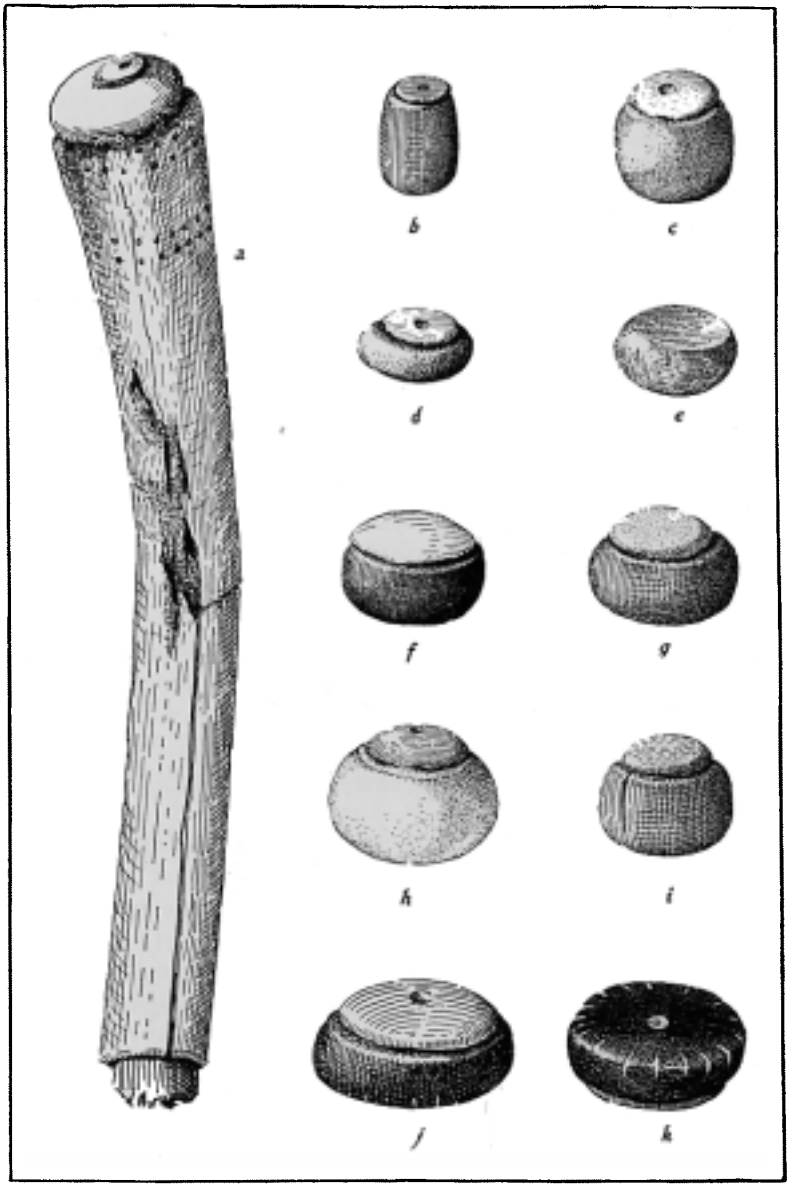
Ceremonial Bundle. In plate 7, b, can be seen what is doubtless a ceremonial bundle, one end resting in the lap of the mummy, the other projecting above the left knee, this being the position in which it was found.

In the center of the bundle lay a wand-like stick, 14½ inches long, which is shown in b, plate 40. One end has a blunt point, is slightly polished for an inch or more, and is stained a dark red color; the opposite end is rounded and shows traces of fire. To one side of the blunt end and projecting beyond is tied a brush-like arrangement of coarse fiber also stained dark red. The same string which binds the fiber to the stick secures to it a long feather of which there remains very little but the shaft. Other articles tied about the stick and figured in the plate, are as follows:

The curious object, shown in d, more nearly resembles a miniature sandal than anything else, being of the same weave as a certain type of Basket-maker sandal. The strings attached to it are not, however, arranged like sandal tie-strings. There is a dressed skin thong, colored red, woven into one end; this may be an unfinished toe-fringe. The specimen is 4 inches long, and 1½ inches wide. The material is fiber string, except the dark line through the center which is of human hair string.

The blade-like object of tough, close-grained wood shown in f, is 12¾ inches long, 1⅛ inches wide, and ⅜ to ⅝ of an inch thick.

[1] Identified by Mr. O. Bangs of the Museum of Comparative Zoölogy, Harvard University.



WHITE DOG CAVE

a, One of a pair of bone tubes showing compound die cemented to upper end;
b–k, Compound dice. (Enlarged 1/5.)

Both the pointed and the rounded ends are blackened as a result of shaping or hardening by fire. The edges of the blunt end are rounded for something over a hand's breadth; for the remaining distance to the beginning of the point both edges are sharp. One edge is rather keener than the other and shows a surface smoothed by wear.

The foreshaft and point of a throwing spear c, from the bundle is the largest in our collection, measuring over 7 inches in length. The point of red jasper, $2\frac{1}{4}$ inches long, 1 inch wide at base, is set in a notch cut in the end of the shaft and secured by a sinew binding which is still in perfect condition, as is the shaft itself except for traces of decay at the tapering end. This specimen, though our largest, is not as long as the foreshafts in the Lang collection from San Juan County, Utah, now in the Deseret Museum, which, according to the table given by Pepper,[1] are $7\frac{1}{4}$ inches to $11\frac{1}{4}$ inches in length.

The tips of the long feather shown in e, is 7 inches in length; the quill at its upper end for a distance of 2 inches is seized with fine flat sinew as shown in the drawing. Another feather, of which only the quill remains, measured $15\frac{3}{4}$ inches in length.

Wrapped about the bundle were the remains of a feather headdress not unlike the feather crowns used by various California tribes in their ceremonies. The method of tying the feathers is shown in the illustration, a; the same knot is also used by the Wailaki and Shasta Indians, specimens of which are in the Museum collection.

Ceremonial Bone Objects. In plate 41, e, will be seen what appears to be merely a pair of bone tubes, but which is in reality a nearly complete example of a very puzzling type to which belong all the other bone specimens illustrated in the plate. To make clear the relationship of these objects a detailed description is necessary.

The two halves of this contrivance are tied tightly together with a strip of yucca leaf. The right-hand unit of the pair is a hollow bone, $6\frac{5}{8}$ inches long, highly polished as if by long use; its upper end is solidly plugged with a dark pitchy substance, the edge of the orifice is cut by six small V-shaped notches; the lower end shows signs of having once been similarly plugged, but is now open; just above the orifice there are two small round holes, drilled directly

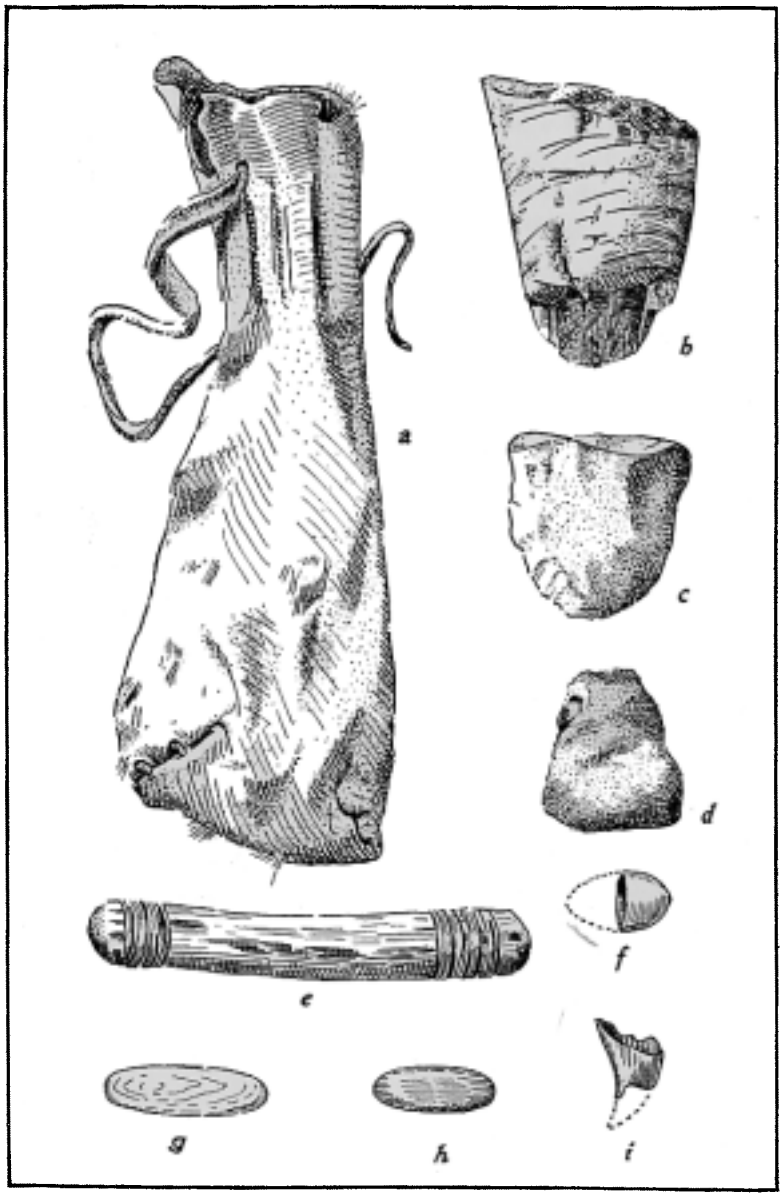
[1] Pepper, 1905, p. 129.

opposite each other (only one shows in the drawing). The left-hand unit is made up of two bones of equal length fastened to each other by being pushed together over a round stick which fits very tightly in their hollow interiors; the joint is further secured by a sinew cord laced back and forth through series of little holes drilled close to the edge of each bone (three of these holes may be made out in the drawing, the rest are hidden by the main yucca leaf binding). Just below the upper end of this compound bone are two horizontal lines of small round pits, or incised dots; these only run half way around and do not appear on the back. The end of the lower piece is pierced on one side by a small hole, and just above the orifice there is scratched a single encircling line. Neither end of the left-hand unit gives any indication of having been plugged as were both orifices of the right-hand bone.

The fragments of the specimen shown in d, are assembled in what were doubtless their original positions. They form a pair very similar to the one just described, but both halves are compound, each being made up of two pieces once held together by an interior stick or dowel. Parts of a main binding that once fastened the two halves to each other are still preserved. The lower part of the left-hand unit has on one side three deep horizontal notches and a single small round hole; the upper piece has three double lines of incised dots which, as in the preceding specimen, only run half way around. The right-hand unit has two similar double lines of dots, one near the bottom, one just below the top. The upper end of each unit is plugged with pitch, in which are set the curious compound objects shown in the drawing. They are flattened spheres of red stone with small, white, perforated discs glued to their tops. The right-hand sphere has been somewhat warped from its original flat position across the end of the bone.

The pair of tubes shown in f, were found together in Sunflower Cave and illustrated in our first report (plate 86, f); they are reproduced here because they are surely of the same nature as the White Dog Cave specimens. They fit snugly when laid side by side and show, indeed, signs of rubbing along the points of contact; hence they once were undoubtedly bound together. Near the upper end of each one, and running only half way around,[1] is an

[1] In our first description we mistakenly stated that the dots encircled the bones (Kidder-Guernsey, 1919, p. 189).



CAVE 6

a–d, Skin pouch and objects found with it in woven bag; e–i, Articles from within pouch. (About 4/5.)

incised line and a row of dots. If pitch was ever used to plug up these bones, it has entirely disappeared.

Two other bone objects (g and h) are fragments which obviously formed parts of pairs identical with the above. They are of the same general shape and size, and have similar rows of small dots only partially encircling them. The upper one, g, is the best preserved of several fragments of a broken specimen; found loose in the same cist with it were four compound " buttons " very like the ones glued to the ends of the pair shown in d.

To sum up: these objects were pairs of bones tied together at the middle; the component parts of each pair might be a single bone, or might be made of two bones fastened end to end. All are decorated with lines of dots, and many, perhaps all, had at one place or another small drilled holes. Some at least were provided with compound " buttons " glued to their ends. The fact that the incised dots never completely encircle the bones, and that the undotted surface of each bone is always the flatter side, seems to indicate that these assemblages were held or worn against something in such a position that one side was not visible. We have only one hint as to a possible use; lying close against the central ligature of the pair figured in d, and apparently engaged by it (the specimen is badly rotted) was a cord hung with nearly a hundred deer-hoofs. The latter may have formed a rattle, and if so, the double bones might perhaps have been some sort of handle for it.

Included here because they were found in the same cists with some of the pairs just described, are two specimens that seem to have served as handles for what we suppose to have been ceremonial wands.[1] The first (plate 42, a) came from the same cist that held the broken paired bones above described. It is a hollow bone, $5\frac{3}{8}$ inches long, the lower end carefully finished, smoothed, and decorated with eight circular cup-like depressions filled flush with black gum. At the upper end it is perforated by two holes through which runs a narrow thong holding a number of other thongs; the ends of such of the latter as are not broken off are knotted about the remains of the butts of small feathers; the ends of the others are simply knotted. The second specimen, b, from the same cist as e and h, plate 41, is a plain tube with a single hole at one end; its similarity to the above handle is obvious.

[1] Compare the bird-headed wooden handle with feathered streamers, plate 39.

Bone Whistle. The specimen illustrated in plate 42, i, was found with the handle last mentioned, one of the complete pairs of bones, and one fragmentary one. Its length is 4½ inches. The lower end is tightly closed with gum, the upper is unsealed. The single rather large opening is partly covered by wrappings of sinew; these seem to have held a bit of reed or other substance, now almost rotted away.

Bone Tubes. The tubes shown in c and d, are both simple lengths of hollow bones with carefully cut ends. They are figured here because we are unable to assign any definite utilitarian function to them.

Compound "Dice." The extremely well-made little objects shown on plate 43, are all from White Dog Cave. Each consists of two parts: a spherical or cylindrical body with rounded bottom and flat top; and a cap, which is a thin disc (often a reused bead with the perforation plugged with pitch) firmly cemented to the flat top of the body. The variety of materials used in their manufacture will be brought out in the descriptions which follow.

The upper and lower sides of the largest example we have is shown in j, k; it measures ¾ of an inch in diameter. The body, of highly polished lignite, is perforated vertically, but the hole is carefully plugged; about the lower edge there runs a series of little cuts. The cap is a fine grained red slate disc-bead, the perforation filled with pitch. This specimen, the only one in the lot which was found singly, came from Cist 52.

One of a set of four from Cist 22, is shown in h. It has a translucent quartz body and a cap of red slate. The other three (not figured) are of lignite; one has an unperforated white bone cap, the caps of the remaining two are missing, but dried cement on the flat tops of the bodies proves that they were once present.

A set of seven was found in a small buckskin pouch in Cist 24. One of these, i, has a dark brown wooden base and a white bone cap; a second, f, has a lignite base with an unusually large white limestone cap; the one shown in g, has a lignite base and a light brown stone cap; b, has a long cylindrical base of lignite and a cap of hard light green stone (not turquoise); the fifth (not figured), a lignite base, and light brown stone cap. The sixth, d, and seventh are of a very peculiar construction which was not suspected until one of them accidentally split in halves. It proved to have been made

by rolling up a tiny pellet of gray clay mixed with grains of crushed azurite and malachite. Around this pellet was added a thin layer of the same mixture, then another and another like the coats of an onion, until the requisite size and shape of the base were attained. The whole was then daubed with pure gray clay, so that the blue and green particles, so thickly sown through the whole interior, do not show on the surface. The cap of the one figured is a flat green stone, that of the split specimen is of red slate; both are about the same size.

A second set of seven, also contained in a buckskin bag, was taken from Cist 24. These are not figured. Two are of lignite with unperforated brown stone caps; four are of the peculiar azurite-malachite-clay composition, the caps of two are missing. Of the two in place one is a perforated brown stone disc, the other an unperforated disc of green stone. The seventh is beautifully shaped from hematite, it lacks the cap, but, as in all such cases, distinct traces of the cement that once held it in place remain.

Two of another set of seven found loose in Cist 27 are also illustrated in plate 43. The one shown in c, is a hard, light green stone with a cap of white bone; e, is of serpentine and lacks the cap. Of the remaining five, one is sandstone of thin cylindrical form; like e, the cap is missing; the other three have green stone bases with bone, pink stone, and red stone caps respectively.

The purpose of these pretty and beautifully made little things is unknown. Two of them were found glued to the ends of bones (plates 41, d, and 43, a), and the set of four above described came from a disturbed cist (6) which contained fragments of similar paired bones. We at first thought that all such " buttons " were meant for a like use, but on careful examination we could find no trace of pitch or other adhesive matter clinging to any of them; furthermore their bottoms are always excellently finished and show, indeed, more polish than do the sides, whereas objects primarily designed to be glued or cemented to other objects, are generally roughened on those parts which were destined to receive the adhesive substance. This, and the fact that we have three separate sets of exactly seven each, has inclined us to believe that they were some form of dice and that their employment as an embellishment for the tips of the peculiar paired bones may have been a secondary one.

MEDICINE POUCHES OF SKIN

Under this heading are included a number of skin bags of various shapes and sizes which were found with burials. They contained assortments of miscellaneous material, much of it of no apparent practical value.[1] As to whether or not the identification of these sacks as medicine pouches is correct, the reader may judge for himself.

Bag and Contents. The container figured on plate 38, a, is made from prairie-dog skins with the hair on, cut and fitted to form a triangular sack 11 inches long, 10 inches across the base, and 3½ inches across the mouth. The skins are arranged so that the heads

FIGURE 16
Skin bag containing beads and feathers, White Dog Cave. (⅓.)

form the mouth of the bag. They are sewn together with a running stitch, the seam inside, the hair side out. Within were a cake of paint, b, and a very small skin bag, c, wrapped with string and holding powdered paint of a brilliant green color. The cake was made of the same paint, apparently moistened and molded into its present shape with the fingers.

Bag with Colored Minerals. This is a little skin container in which were found about twenty small unworked fragments of azurite and malachite.

Dice Bags. These were both taken from Cist 24, White Dog Cave. They are little buckskin bags; each contained seven of the peculiar compound " dice " described above.

Sack with Beads and Feathers. This specimen is illustrated in figure 16. It is a bag of what appears to be badger skin with the hair on, which is somewhat rotted and has split down the side. In

[1] Similar assortments were found with Sayodneechee burials. Kidder-Guernsey, 1919, p. 30.

it are about a teacup full of small cylindrical black seed beads; a few discoidal bone beads; and six large flat stone beads, two of which are of alabaster. There are also eleven large hawk feathers and a section 7 inches long broken from the stalk of a plant with a pithy stem.

Pouch and Small Articles. This heterogeneous assemblage (plate 44) was found in the woven bag shown in plate 30, d, taken from Cave 6. Some of the objects were loose in the woven bag, the remainder were contained in the little skin pouch, a, of the former plate. The latter is made from a piece of thin animal hide, soft dressed with the hair on, folded to form a small, narrow sack 5 inches long, and sewn with fiber string. After having been sewn it was turned to bring the seam inside. A buckskin tie-string is attached to the top. Only traces of the fur remain.

The objects found loose in the woven bag are: a fragment of a fossilized mammalian tooth, b; a piece of hard yellow ochre showing rubbing facets, and grooves such as might have been made by coloring a cord, and in spots, a curious gloss, c; a small lump of organic substance resembling dried fruit, d; and half of a squash seed, f.

In the little skin pouch were: a part of the horny claw cover of an animal, presumably dog or wolf, i; an oval bone die, g, similar to those figured in our first report,[1] except that both sides are convex, instead of one being convex and one flat; a wooden die of bi-convex shape with one surface coated with pitch as in the 1915 examples just referred to, h. The remaining specimen from the pouch is a section $2\frac{3}{4}$ inches long cut from a greasewood stick, e. The ends are rounded and wrapped with sinew, and a groove runs the whole length of the under side, the entire object having been painted a dull red.

SUMMARY AND CONCLUSIONS

Summary of Material Culture. Of the dwellings of the Basket-makers we know next to nothing. Certain crudely-built stone structures in Goat Cave (plate 2, a, b) may be Basket-maker, but the evidence is not conclusive. In Cave 14 were found cists made of large slabs and closed over with conical wood and adobe roofs;

[1] Kidder-Guernsey, 1919, p. 189 and plate 86, g.

these were built above ground and against the cliff-wall (plate 9, e, f). There is little doubt in our minds that they are Basket-maker products, and they have a distinctly house-like appearance; but their very small size argues for their use as storage places rather than as domiciles. We believe at present, therefore, that the Basket-makers lived mostly in perishable structures built in the open, and only resorted to the caves for temporary shelter in severe weather.

Although they apparently did not live regularly in the caves, they took full advantage of them for the storage of their crops and for the burial of their dead. For both purposes they used cists. These occur in several well-defined varieties (see plate 9). Where the cave floor was of solid hard-pan they excavated plain, jar-shaped cavities in it; some of these have little tunnels or " flues " leading to smaller, shallower holes set about their mouths. When the floor of the cave was of material so loose as to render the above forms unpractical, they scooped out holes, larger or smaller according to their requirements, and lined them with large, flat, stone slabs to hold back the sand. These are the commonest types, and served, apparently, either for storage or burial. Semi-subterranean (Cave 2, 1915), or above-ground cists (Cave 14) with slab foundations and adobe superstructures complete the list; we have so far not found burials in them.

Burial customs were very uniform; the bodies were flexed, wrapped in fur-string blankets and twined-woven bags, and deposited, with numerous mortuary offerings, in the cists. Interments were almost never single; in most cases two to four individuals were buried together.

The Basket-makers grew corn of a single, apparently primitive, variety; squashes also were raised, but the most careful search has so far failed to reveal any evidence of bean culture. The turkey was probably not domesticated. The people covered themselves with robes of fur cloth and dressed hides; men wore a breech-cloth and "gee-string"; the women a short string skirt. The usual footgear was the square-toed sandal, a type which differs from all others in the Southwest in shape, in the presence of a toe-fringe, and in the fact that the soles of the better specimens are provided with a looped " pile " reinforcement covering their entire length.

Children and the adults of both sexes were well supplied with necklaces of stone and shell beads, as well as with pendants of stone and abalone shell; turquoise, apparently, was unknown. Hair-dressing in the case of males was elaborate. The back hair was gathered into a short chubby knot to which was fastened a thin braided scalp-lock falling from the crown of the head; there was often a wide " part" and a tonsure from which the hair was clipped close. Women seem to have worn the hair short; their heads may have provided the great quantity of human hair that was used for string.

Cradles were of two types: the rigid, with wooden frame, twig or reed backing, and padded edge; and the flexible, made of grass or cedar bark. Young babies were always provided with stuffed pads, bound to the navel to prevent rupture.

Basketry was very abundant indeed, but was exclusively of the coiled variety, with two-rod-and-bundle foundation, and with wooden sewing splints. The weave is coarse, but even and very firm; decoration is in black or black-and-red; the designs have a sort of family resemblance to those of the modern tribes of central and northern California. The principal forms are trays, bowls and large panniers. No wickerwork, twined or checker-work baskets were found.

Of textile fabrics, these people turned out very limited amounts of apocynum string cloth, plain over-and-under weave. It was undoubtedly woven on some form of loom, but the small size of the individual pieces produced and the crude nature of the selvages give the impression that the art of loom weaving was still in its infancy. This theory is strengthened by the fact that the designs were either painted on the fabric or made by rubbing color onto the wefts as they were being woven, rather than produced, as in more perfected systems, by the use of separate wefts dyed before insertion. The most elaborate textiles are the hand-twined bags, usually made of apocynum string, and decorated by painting or by rubbing color on the wefts in process. The abundance of such bags is very striking. Although an enormous quantity of finely spun string was employed for the textiles and for a variety of other purposes (such as in rabbit-nets, string aprons, fur cloth, etc.), we have never found any trace of the use of a spindle, either plain or whorled. Fur cloth was much used, true feather-cloth never.

Skin was well dressed and entered into many industries, but most strikingly so in the making of all sorts of small to medium sized bags and pouches, the most characteristic of which are sacks formed of two to seven or eight prairie-dog hides sewed together in such a way that the heads of the animals arranged side by side formed the necks of the bags.

The Basket-makers had few superiors in the careful working of wood; their weapons and implements show as fine shapes and as perfect finish as can be achieved with stone tools. The most typical objects are the atlatl and dart (used, apparently, to the entire exclusion of the bow and arrow); the grooved club; and the crooked shafted, plain-gripped digging stick.

Artifacts of stone are very poorly represented in the collection. There are no specimens of the following types, all common in the cliff-houses and pueblos: axes, both grooved and grooveless, hammer stones, polishing stones, "sandal lasts," chipped scrapers, arrowheads, or long drills. As these lacking forms are all strictly utilitarian in function, their absence may be due to our material being almost exclusively from graves and temporary cave-shelters, rather than from long inhabited dwelling places. It would not surprise us, however, to find that the grooved axe was unknown to the Basket-makers, as that implement among the northern Cliff-dwellers is always of a rude, unspecialized type and therefore presumably of late introduction. The grooved axe is, indeed, entirely absent from the areas to the west and northwest of the Pueblo district.

Of such stone objects as do occur, the most characteristic are the heavy discoidal and sub-spherical beads, the short squat pipes and the large, triangular, tanged dart-points. The chipping of the latter, and of certain large flint knife-blades, is very skillfully done.

Bone tools, like those of stone, are not common in our collection; there are a few simple awls, a few beads, some whistles, and some pairs of decorated tubes which we have classed as ceremonial. There are no bone scrapers. The rarity of awls, among the remains of a people who produced as much coiled basketry as did the Basket-makers, is very peculiar; it is probably due to the fact that we have not yet succeeded in finding long-occupied dwelling places.

While feathers played an unimportant part in the making of robes, having been used only for fringes and ornamental borders, they were much employed in the making of all sorts of ceremonial paraphernalia, as well as for the winging of atlatl darts. Bundles of large feathers, destined probably for the latter purpose, were found in several caves.

True pottery, as far as we know, was not made. The only specimens of burned clay that we have are two small pipes found in 1914–1915. In the present report is described a fragment of an unfired dish with basket marked exterior; this may represent a very primitive form of pottery. In which case again we feel the lack of material from village sites, as it is possible that pottery really did exist but that it never, for some reason, found its way into the graves.

As to pictographs, we only know that the painting of large square-shouldered human figures on the walls of caves was a typical, and apparently an exclusive Basket-maker practice. We have never been able to identify any pecked pictographs as of Basket-maker origin.

Conclusions. Before entering into any discussion of the place of the Basket-makers in the general scheme of Southwestern archaeology, it must first be demonstrated that their culture is really a distinct one. If this cannot be done, if the so-called Basket-maker remains from Grand Gulch and the Kayenta region are to be considered as only a specialized local phase of the widespread Pueblo-Cliff-dweller civilization, then they naturally cease to have any chronological or morphological interest. The authors, however, feel sure that such is not the case; a summary of the evidence follows.

The cliff-houses and pueblos of this region are stone-built dwellings of coursed masonry, laid up with adobe mortar; the rooms are rectangular. Corn of several varieties was cultivated, as well as beans and cotton; the turkey was domesticated. Of the minor arts, the most important was pottery making. Equally characteristic are: twilled yucca leaf sandals, twilled rush matting, and twilled ring-baskets, cotton loom cloth, turkey-feather string, and the bow and arrow. These objects, together with pottery, make up nine-tenths of any collection from the cliff-houses. Turning to the graves, we find that Cliff-dweller skulls were always artificially

flattened at the back, and that the bodies, accompanied by generous offerings of pottery, were interred in individual graves, usually in the open.

The Basket-makers, on the other hand, certainly built no houses of coursed masonry; they may, in fact, have possessed no more permanent dwellings than do the Navajo of today. Their corn was of a single, rather primitive, variety; they were ignorant, apparently, of beans and cotton, nor did they domesticate the turkey. They made no pottery worthy of the name (or if they did, it never found its way into the graves), and all the other characteristic Cliff-dweller specimens mentioned above are conspicuous by their absence. They are replaced, however, by such equally characteristic Basket-maker products as the square-toed sandal, the twined-woven bag, and the atlatl. The heads of the Basket-makers were never artificially deformed. The graves, instead of being in the open, were cists excavated in the hard-pan or the sandy fill of caves, and from two or three to ten or more bodies were placed in each cist. Mortuary offerings were numerous and varied, but the one invariable gift to the dead was coiled basketry.

In the above summaries only the leading traits of the two cultures are catalogued. A more detailed comparison in tabular form has been published elsewhere,[1] but enough is here presented to show the essential differences between them, particularly when it is considered that all finds of each class have always run true to form: pottery, for example, and deformed skulls have never appeared in Basket-maker graves; the rubbish of cliff-houses has never given evidence of the manufacture of, for instance, twined-woven bags or the atlatl.

We may now take up the question of age. Here again we are on firm ground. The Basket-makers definitely antedated the Pueblo-Cliff-dweller people. This was stated long ago by the Wetherills and McLloyd and Graham,[2] and was proved to us by the superposition of Cliff-dweller remains upon Basket-maker burials in Sunflower Cave. Even without this clear stratigraphic evidence, the case was reasonably certain, for in several of the other sites investigated we found cliff-house pots or sherds in surface-sand overlying Basket-maker burials but never in the graves themselves. Furthermore, during the 1915 work in Sunflower Cave there was

[1] Kidder-Guernsey, 1919, p. 204.

[2] Pepper, 1902.

taken from the cliff-house rubbish a square-toed Basket-maker sandal.[1]

We have proved, to our own satisfaction at least, that the Basket-makers were a people culturally distinct from the Cliff-dwellers; and also that they antedated the latter. At this point definite knowledge ceases; and to the very important questions of the origin of the Basket-maker culture, and of its relation to that of the Cliff-dwellers, we can supply only conjectural answers.

As to origin, it may be said that several traits, such as corn growing and the use of the atlatl, point toward Mexico. The peculiar curved, grooved hand-club, and the method of hair-dressing were both features of the somewhat Mexicanized Maya culture of late prehistoric and early historic times in Yucatan. Furthermore, the only archaeological finds which remind one of the Basket-makers have come from the Coahuila caves in northern Mexico, and from the Tularosa caves in southern New Mexico. The latter sites lie roughly half way between the Kayenta region and Coahuila. Just how much weight should be attached to these bits of evidence we do not know, but it seems to us certain that germs of the culture worked northward from the Mexican highlands in very early times.

Although the question of their origin is obscure, we know at least that the Basket-makers were living in the lower San Juan country prior to the opening of the Pueblo-Cliff-dweller period. As to the relations of the cultures two hypotheses suggest themselves: first, that the Basket-makers were a distinct people who were crowded out of the region by the arrival of their more highly developed successors; second, that they were the direct ancestors of the latter.

If the first hypothesis be correct we need not postulate any great time interval between the two cultures; as one came in, the other was destroyed or moved away. If, on the other hand, we believe that the one developed from the other, we must be prepared to allow a very considerable time for the transition, for there are many radical differences between the cultures; and we have so far

[1] This illustrates an important principle of archaeological evidence, viz.: Given two cultures, A and B, in the same area; if A objects are found in B sites, but B objects never in A sites, A may be safely considered older than B. The sporadic finding of Basket-maker products in cliff-houses may be expected in the future, particularly as it is probable that the frequent spoliation of Basket-maker burials was the work of the Cliff-dwellers.

sought in vain for any trait running from the one to the other through an unbroken logical and surely demonstrable evolution. While there are missing links in every such chain, it is possible that in this case some of them may yet be supplied by the hitherto little-known "pre-pueblo" or "slab-house" sites that archaeologists are beginning to uncover in various parts of the Southwest. All such sites hitherto examined have, however, been found in the open and so have yielded no specimens of a perishable nature; hence they have provided us with no evidence as to basketry, sandals, food products or wood-working, the very phases of material culture with which we are most familiar in the case of the Basket-makers and which we therefore most need for comparative and developmental studies. A rigorous search should accordingly be made for " pre-pueblo " habitations and graves in locations where they may be expected to be found protected from moisture. If such are discovered, it should be an easy matter, in view of our accurate knowledge of both the Basket-makers and the developed Cliff-dwellers, to determine definitely whether or not the " pre-pueblo " people were culturally intermediate between them.

To return to the first hypothesis, namely, that the Basket-makers were crowded out of the region by the Cliff-dwellers, and settled somewhere along its edges. We have examined collections from many modern southwestern tribes who possess cultures of about the same grade as that of the Basket-makers, in the hope that we might find some evidence of their descent from the ancient people. Nothing definite could, however, be established, although similarities in basketry, rabbit-nets, and hair ornaments were noticed in the Paiute collections; and, among the Mohave material, in the form and weave of twined bags and in the practice of plugging with wood the quills of feathers. Too much significance, however, must not be placed upon similarities such as the above, for the remarkable state of preservation of the Basket-maker material makes it appear so much like a collection from an existing tribe that it is particularly easy to fall into the way of drawing technological comparisons between it and modern articles, losing sight of the fact that the Basket-maker products are really of great antiquity and that the Paiute, Mohave, and other collections are things of yesterday. Where similarities occur, therefore, their significance as showing direct connection is open to question; the

long time interval has permitted the working of too many as yet unassayable factors of culture-growth and transmission.

It may seem to the reader that we have been unduly cautious in our failure to draw any definite conclusions. The work, however, is just beginning, and it is our desire to do no more than record for other students the evidence so far accumulated, and to present the few speculations as to its meaning which we have allowed ourselves to indulge in.

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